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OCT - 9 2019

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 26, 2019

Mr. Scott Glenn, Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 S. Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Mr. Glenn,

With this letter, the Department of Land and Natural Resources, Land Division, on behalf of applicant Kauai Island Utility Cooperative, hereby transmits the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI) for the Waiahi Hydropower Long-Term Water Lease situated at TMKs (4) 3-9-001:001 and 3-8-001:001, 002, and 003 in the Puna District on the island of Kauai for publication in the next available edition of *The Environmental Notice*.

Enclosed is a completed OEQC Publication Form, one (1) copy of the DEA-AFONSI, three (3) Adobe Acrobat PDF files of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Ian Hirokawa at (808) 587-0420.

Sincerely,

Suzanne D. Case
Chairperson

Enclosures

C: Dawn Huff, Joule Group

20-089

Submittal Form for HRS Chapter 343 Publications in the Periodic Bulletin : Entry # 612

Action Name

Waiahi Hydropower Long-Term Water Lease

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds
- (2) Propose any use within any land classified as a conservation district

Judicial district

Līhu'e, Kaua'i

Tax Map Key(s) (TMK(s))

(4) 3-9-001:001, 3-8-001:001, 3-8-001:002, 3-8-001:003

Action type

Applicant

Other required permits and approvals

Numerous

Discretionary consent required

Long-term lease of water rights

Approving agency

DLNR-Land Division

Agency contact name

Ian Hirokawa

Agency contact email (for info about the action)

ian.c.hirokawa@hawaii.gov

Email address or URL for receiving comments

jscheffel@ssfm.com

Agency contact phone

(808) 587-0420

Agency address

Submittal Form for HRS Chapter 343 Publications in the Periodic Bulletin : Entry # 612

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Honolulu, HI 96813
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Map It

Applicant

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Applicant contact name

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Was this submittal prepared by a consultant?

Yes

Consultant

SSFM International, Inc.

Consultant contact name

Jennifer Scheffel

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Consultant address

Submittal Form for HRS Chapter 343 Publications in the Periodic Bulletin : Entry # 612

99 Aupuni Street
Suite 202
Hilo, HI 96720
United States
Map It

Action summary

KIUC has requested a 65-year long-term water lease from the Board of Land and Natural Resources for the diversion of water from the North Fork Wailua River and Waikoko Stream for the Upper and Lower Waiahi Hydropower Plants to replace the existing revocable permit authorizing the diversion of water from the North Fork Wailua River and Waikoko Stream Diversions. KIUC is requesting to divert at the North Fork Wailua River all water available in the stream above and beyond 3.5 mgd at the diversion and at the Waikoko Stream all the water available in the stream above and beyond 0.8 mgd at the diversion, up to the ditch capacity, which is estimated to be 30 mgd below the Waikoko Stream Diversion. Upon receipt of the long-term water lease, KIUC would make permanent modifications to the diversion structures to ensure the IFS established by CWRM remains in the stream channel at all times.

Reasons supporting determination

Please see Section 5.1 of the Draft EA

Attached documents (signed agency letter & EA/EIS)

- DLNR_Letter.pdf
- 190925-Waiahi-Draft-EA.pdf

Action location map

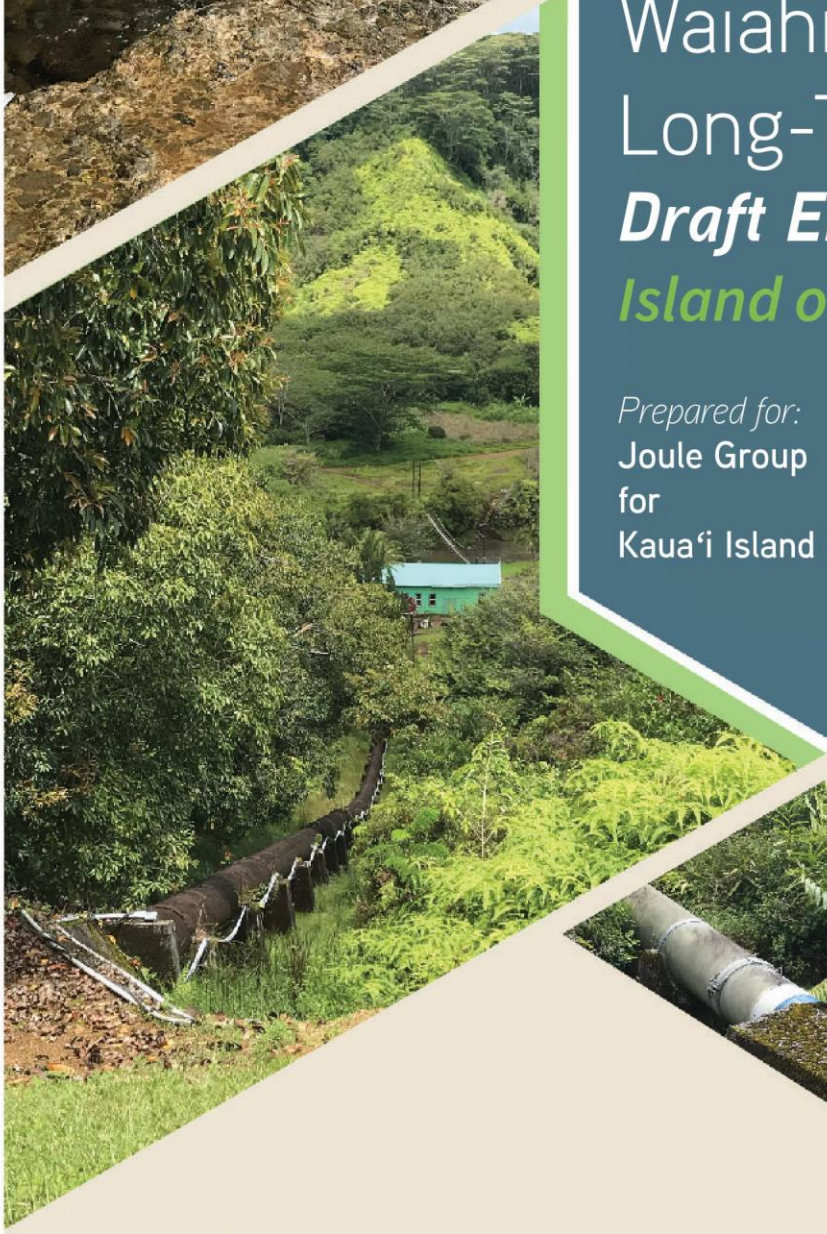
- Waiahi-Hydropower-Project-Location.zip

Authorized individual

Jennifer Scheffel

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.



October 2019

Waiahi Hydropower Long-Term Water Lease

Draft Environment Assessment

Island of Kaua'i, Hawai'i

Prepared for:
Joule Group
for
Kaua'i Island Utility Cooperative

Prepared By:
SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawai'i 96720

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Waiahi Hydropower
Long-Term Water Lease

Island of Kauaʻi, Hawaiʻi

Prepared for:

Joule Group

for

Kauaʻi Island Utility Cooperative

Prepared by:

SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawaiʻi 96720

October 2019

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Project Summary

Project Name	Waiahi Hydropower Long-Term Water Lease
Location	Island of Kauaʻi
District	Puna
Project Site Tax Map Keys	(4) 3-9-001:001, 3-8-001:001, 3-8-001:002, 3-8-001:003
Landowners	• State of Hawaiʻi Department of Land and Natural Resources Division of Forestry and Wildlife • Grove Farm • KIUC
Project Site Existing Uses	Water diversion for Upper and Lower Waiahi Hydropower Plants
State Land Uses	Conservation
Kauaʻi County Zoning	Conservation
Proposed Action	KIUC has requested a 65-year long-term water lease from the Board of Land and Natural Resources for the diversion of water from the North Fork Wailua River and Waikoko Stream for the Upper and Lower Waiahi Hydropower Plants to replace the existing revocable permit authorizing the diversion of water from the North Fork Wailua River and Waikoko Stream Diversions. KIUC is requesting to divert at the North Fork Wailua River all water available in the stream above and beyond 3.5 mgd at the diversion and at the Waikoko Stream all the water available in the stream above and beyond 0.8 mgd at the diversion, up to the ditch capacity, which is estimated to be 30 mgd below the Waikoko Stream Diversion. Upon receipt of the long-term water lease, KIUC would make permanent modifications to the diversion structures to ensure the IFS established by CWRM remains in the stream channel at all times.
Anticipated Impacts	No long-term impacts to any resource are anticipated with implementation of the Proposed Action. Any impacts would be during the construction phase at the North Fork Wailua River and Waikoko Stream Diversions and would be short-term and temporary. The Proposed Action would have beneficial effects associated with the generation of renewable energy and would further help to achieve the State of Hawaiʻi's goal of 100% renewable energy by 2045. The Proposed Action would also have beneficial effects to stream habitat and biota and groundwater (compared with current conditions) associated with the permanent modifications at the North Fork Wailua River and Waikoko Stream Diversions.
Applicant	Kauaʻi Island Utility Cooperative 4463 Paheʻe Street #1 Līhuʻe, HI 96766 (808) 246-4300

Approving Agency	Department of Land and Natural Resources – Land Division 1151 Punchbowl Street, Room 220 Honolulu, Hawaiʻi 96813 (808) 312-6357
Anticipated Determination	Finding of No Significant Impact
Project Site Permits/ Approvals Required	See **Section 2.4: Permits and Approvals Which May Be Required for the Proposed Action**
EA Preparer	SSFM International 99 Aupuni Street, Suite 202 Hilo, Hawaiʻi 96720 Contact: Jennifer Scheffel (808) 356-1273
Individuals, Community Groups, and Agencies Consulted	See **Section 6**: **Agencies and Organizations Consulted**

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Appendices

Appendix A Water Lease Documentation

Appendix B IIFS and Production Impacts

Appendix C Terrestrial Flora and Fauna Survey Report

Appendix D Stream Habitat Assessment

Appendix E Update to 2017 Cultural Impact Assessment

Appendix F Socioeconomic Impact Assessment

Appendix G Pre-Assessment Consultation

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Acronyms

%	percent
AAQS	Ambient Air Quality Standards
BLNR	Board of Land and Natural Resources
BMPs	Best Management Practices
CAA	Clean Air Act
cfs	cubic feet per second
CIA	Cultural Impact Assessment
CWRM	Commission on Water Resources Management
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DHHL	Department of Hawaiian Home Lands
DLNR	Department of Land and Natural Resources
DOFAW	Division of Fish and Wildlife
EA	Environmental Assessment
FDC	flow duration curve
FONSI	Finding of No Significant Impact
HIGAP	Hawaiʻi Gap Analysis Program
HRS	Hawaiʻi Revised Statutes
IFS	Inflow Stream Standards
KIUC	Kauaʻi Island Utility Cooperative
kW	kilowatt
kWh	kilowatt hour
mgd	million gallons per day
msl	mean sea level
MW	megawatt
MWh	megawatt hour
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NPDES	National Pollutant Discharge Elimination System
OHA	Office of Hawaiian Affairs
RP	Revocable Permit
TMDL	Total Maximum Daily Loads
TMK	tax map key
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRCC	Western Regional Climate Center

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1 PROJECT DESCRIPTION

1.1 Introduction

Kauaʻi Island Utility Cooperative (KIUC) is a not-for-profit electric cooperative engaged in the production, purchase, transmission, distribution, and sale of electricity on the island of Kauaʻi. KIUC's renewable energy portfolio has grown in the last seven years from 9.4% percent (%) in 2012 to 55% today with hydroelectric generation being a significant and valuable component of the renewable enegy resource available on Kauaʻi. A portion of KIUC's hydroelectric generation is produced by two hydropower plants owned by KIUC and referred to as the Upper Waiahi Hydropower Plant and the Lower Waiahi Hydropower Plant, both of which are located on Waiahi Stream. KIUC is currently diverting water from the North Fork of the Wailua River and from the Waikoko Stream and operating the ʻIliʻiliʻula North Wailua Ditch pursuant to Revocable Permit (RP) No. S-7340 issued by the Board of Land and Natural Resources (BLNR) to operate the two KIUC owned hydropower plants. These two diversions are collectively referred to in the revocable permit as "Blue Hole" but for the purposes of this assessment they are referred to as the North Fork Wailua River Diversion and Waikoko Stream Diversion. On June 24, 2016, the Department of Land and Natural Resources' (DLNR) Revocable Permit Task Force recommended that DLNR work with holders of water revocable permits to initiate the process of converting to water leases (DLNR, 2016).

This project is subject to the state environmental review process prescribed under Chapter 343 (Environmental Impact Statements), Hawaiʻi Revised Statutes (HRS), as amended, also known as the Hawaiʻi Environmental Policy Act, and Title 11, Chapter 200 (Environmental Impact Statement Rules), Hawaiʻi Administrative Rules (HAR). Under these regulations, nine specific types of action are identified that "trigger" environmental review.

This project triggers the state environmental review process under these regulations because the North Fork Wailua River and Waikoko Stream Diversions are located on state lands and lands that are classified as Conservation District by the State Land Use Commission, and these facilities would be modified as discussed in **Section 2.1.2**. Although the long-term water lease is eligible for an exemption from preparation of an Environmental Assessment (EA), the DLNR's Attorney General made a discretionary decision to require the preparation of an EA for the long-term water lease component of the Proposed Action.

1.2 Project Background

The Upper and Lower Waiahi Hydropower Plants have been in operation for over 80 years and were originally built by Līhuʻe Plantation Company for their sugar operations. These hydropower plants use water diverted from streams within the Wailua watershed. The first lease for the use of the water was issued by the State of Hawaiʻi to the East Kauaʻi Water Company in 1965. The lease allowed for diversion of water at the North Fork Wailua River and Waikoko Stream Diversions. The lease had a term of 30 years and expired in 1995 after which it was continued via a revocable permit.

Kauaʻi Electric assumed operation of the two hydropower plants in 1999 after the closure of Līhuʻe Plantation and was granted approval from the BLNR for continued water use from the North Fork Wailua River and Waikoko Stream Diversions. KIUC acquired Kauaʻi Electric in 2002 and assumed operations of

the hydropower plants at that time. The BLNR granted RP No. S-7340 for the use of an annual average of 14.2 million gallons per day (mgd) in December 2002.

KIUC's predecessor, Kauaʻi Electric, filed a water lease application for the operation of the North Fork Wailua River and Waikoko Stream Diversions with DLNR in July 2001. In May 2004, KIUC obtained legislative approval from the Hawaiʻi State Legislature via a concurrent resolution (HCR No. 124) to obtain a long-term water lease. KIUC renewed the water lease application in June 2004 to continue diverting water for the operation of the Upper and Lower Waiahi Hydropower Plants. The renewed lease application was on the December 10, 2004 agenda for the BLNR and the Office of Hawaiian Affairs (OHA) requested a contested case. KIUC and OHA subsequently entered into a Memorandum of Agreement (MOA) in November 2006 resolving the contested case hearing, which was withdrawn by OHA in 2012. The MOA identified studies, the scope of which would be mutually agreed upon by OHA and KIUC and that KIUC agreed to undertake, including a stream biota study and a cultural impact study. The stream biota study and habitat assessment modeling was completed in 2010 and 2013, respectively. The cultural study was completed in 2010. In 2013, KIUC initiated an expanded scope of work agreed upon by OHA for a Cultural Impact Assessment (CIA).

In December 2017, the BLNR approved[1] the holdover of the current revocable permit with amendments that included the following:

1. Within one year, KIUC will provide the Board with a proposal for the partial restoration of flow to the Wailua River, which could be satisfied by the adoption of interim Instream Flow Standards (IFS).
2. Direct DLNR staff to work with landowners on what is expected for the watershed management plan.
3. KIUC shall consult with the Department of Hawaiian Home Lands (DHHL) and honor DHHL's reservation rights of water under the law.

KIUC fulfilled all of these terms. Partial flow restoration was completed at both the North Fork Wailua River and Waikoko Stream Diversions by May 2018. KIUC consulted with DHHL regarding their water needs and water reservations in the Wailua Watershed, which is discussed in **Section 4.1.4**. While KIUC contacted DOFAW on several occasions throughout 2018 in an effort to discuss watershed management plans and requirements, DOFAW requested to postpone these discussions until a cost share formula could be defined and adopted by the BLNR.

In December 2018, the BLNR approved[2] the holdover of the revocable permit with a restriction on the volume of diversion to 8.0 mgd at median flow at the North Fork Wailua River Diversion and 1.6 mgd at median flow at Waikoko Diversion. It is KIUC's understanding that this limitation on diversion volumes was intended to implement the interim IFS recommended by Commission on Water Resources Management (CWRM) staff in August 2018. In addition, the BLNR included a condition that KIUC invite Earthjustice, Kiaʻi Wai O Waiʻaleʻale, Sierra Club, Grove Farm, and DHHL (together called the "Working Group") to participate in a facilitated discussion regarding their respective positions on KIUC's request to

[1] BLNR Meeting Minutes, December 8, 2017, p. 16
[2] BLNR Meeting Minutes, December 14, 2018, p. 10

use State water for its hydroelectric plants. The BLNR further instructed that the Working Group may invite other individuals or organizations to participate in the discussion and that KIUC shall report back to the BLNR on the progress of the discussion in three months.

In January and February 2019, KIUC made further adjustments to the ditch system to limit diversion volumes at median flows at the North Fork Wailua River and Waikoko Stream Diversions and to ensure the CWRM staff recommended IFS values are implemented in the best way possible prior to receiving permits for diversion modifications. Also, KIUC sought support from Mr. Robbie Alm as a facilitator for the Working Group discussions. Mr. Alm held three meetings with the Working Group participants, and KIUC submitted the progress report to the BLNR on March 18, 2019.

BLNR documentation regarding the water lease and revocable permit approvals is included in **Appendix A**.

In January 2018, KIUC initiated additional studies to support the completion of an EA and in order to comply with HRS Chapter 343 requirements. Studies undertaken in 2018 include the following:

- Terrestrial Flora and Fauna Study (**Appendix C**)
- Additional stream studies and an update of 2013 Habitat Assessment Model (**Appendix D**)
- Expanded Scope of Work and update of 2017 Cultural Impact Assessment (**Appendix E**)
- Socioeconomic Study (**Appendix F**)

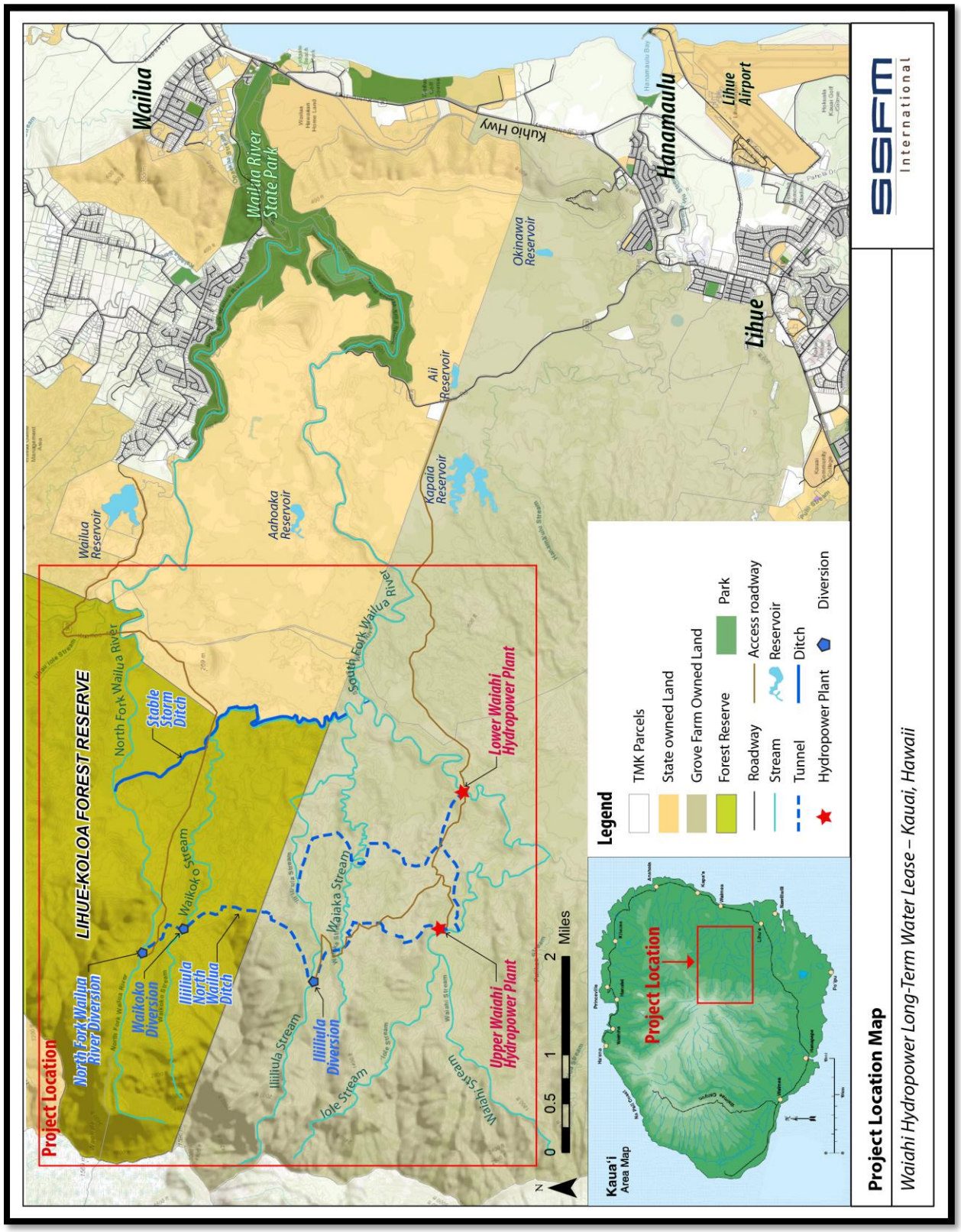
1.3 Project Location and Land Ownership

The Waiahi Hydropower plants are located in the Puna Mokuʻon the island of Kauaʻi, mauka of Wailua, Līhuʻe, and Wailua River State Park, as shown in **Figure 1**. The North Fork Wailua River and Waikoko Stream Diversions are located in the Līhuʻe Kōloa Forest Reserve on tax map key (TMK) (4) 3-9-001:001, which is owned by the State of Hawaiʻi and managed by the DLNR's Division of Forestry and Wildlife (DOFAW). The area is in the Conservation District in the Resource Subzone, as discussed in **Section 4.1.2**. The other diversions are located on TMK (4) 3-8-001:001, which is owned by Grove Farm. The Upper Waiahi Powerhouse is located on TMK (4) 3-8-001:002, and the Lower Waiahi Powerhouse is located on TMK (4) 3-8-001:003, both of which are owned by KIUC. The ʻIliʻiliʻula North Wailua Ditch spans both state and private land: the upper one-third portion is in the Līhuʻe Kōloa Forest Reserve and the lower two-thirds portion is on private land owned by Grove Farm.

The North Fork Wailua River Diversion is located on the North Fork Wailua River, and the Waikoko Stream Diversion and the Upper and Lower Waiahi Hydropower Plants are located on tributaries to the South Fork Wailua River. The North Fork and South Fork Wailua Rivers merge into the mainstem Wailua River approximately 10,500 feet upstream from the mouth of the river.

Access to the North Fork Wailua River and Waikoko Stream Diversions is via a four-wheel-drive road that is managed by DOFAW and referred to as Loop Road or Wailua Forest Management Road. Access to the ʻIliʻiliʻula Stream Diversion and the Upper and Lower Waiahi Powerhouses is via four-wheel-drive private roads on Grove Farm property.

Figure 1. Project Location Map



1.4 Description of Existing Facilities

The Upper and Lower Waiahi Hydropower Plants were originally built by the Līhuʻe Plantation Company for their sugar operations. Water is supplied to the plants through the ʻIliʻiliʻula North Wailua Ditch System and the North Intake Ditch. The diversions are typical plantation style, passive concrete structures spanning the full streambed and diverting all low to moderate flows. The two hydropower plants have a combined installed capacity of 1,500 kilowatts (kW) as shown in **Table 1**.

Table 1. KIUC Waiahi Hydropower Plants

Facility Name	Year Built	Capacity	Turbine	Head
Upper Waiahi Hydro	1930	700 kW	1 x Francis	254 ft
Lower Waiahi Hydro	1914	800 kW	1 x Francis	205 ft

The Upper Waiahi Hydropower Plant was put into service in early 1930 with a nameplate capacity of 500 kW and a maximum output of 407 kW. It was later upgraded to a nameplate capacity and maximum output of 700 kW with no increases in volumes of diverted water.

The Lower Waiahi Hydropower Plant was first put into service in 1914 with a capacity of 600 kW. In 1941, the Lower Waiahi Hydropower Plant was upgraded to an output of 800 kW. The continued operation of these two facilities allows KIUC to avoid burning approximately 675,000 gallons of diesel per year.

The ʻIliʻiliʻula North Wailua Ditch and the North Fork Wailua River and Waikoko Diversions were constructed in the 1920's. The Upper and Lower Waiahi Hydropower Plants are integral parts of the ditch system and water delivery regime. The majority of Līhuʻe Plantation's agricultural fields were located in the South Fork Wailua area. Multiple diversions and ditch systems were built in the Wailua watershed to transport water from the North Fork Wailua River to the South Fork Wailua River basin where subsequent diversions delivered water to agricultural fields in the southern portion of the watershed. Historically, water was also transferred from Hanalei River through the Hanalei Tunnel into the North Fork Wailua River, and then subsequently diverted into the South Fork Wailua River through the Stable Storm Diversion and Ditch.

In the 1990's, the Stable Storm Diversion was completely destroyed by natural flood events and is no longer operational and the Hanalei Tunnel hasn't been operational for a number of years. While the Stable Storm Ditch is still in place, it hasn't been maintained and doesn't actively deliver water from the North Fork Wailua River. The ʻIliʻiliʻula North Wailua Ditch is the only remaining system actively diverting water from the North Fork Wailua River to the South Fork Wailua River basin, thereby supplementing natural stream flow available for irrigation and other downstream uses on the Upper Līhuʻe and Hanamāʻulu Ditch systems.

Water for the Upper Waiahi Hydropower Plant is supplied by the ʻIliʻiliʻula North Wailua Ditch, which is approximately five miles in length and runs from north to south across the Wailua watershed. The ditch system is comprised of earthen and concrete lined open-ditch sections, tunnels, culverts, and one siphon. The ʻIliʻiliʻula North Wailua Ditch picks up water from three primary diversions and six smaller contributors, some of which are seasonal. The primary diversions are on the North Fork Wailua River and Waikoko and ʻIliʻiliʻula Streams. The North Fork Wailua River Diversion is at the beginning of the ditch system and is the largest contributor providing up to 50% or more of the total ditch flow.

Water is delivered to the Lower Waiahi Hydropower Plant via two primary diversions: one on Waiahi Stream and one on ʻIliʻiliʻula Stream downstream of the diversion into the ʻIliʻiliʻula North Wailua Ditch. This ʻIliʻiliʻula Stream Diversion is at the beginning of the North Intake Ditch, which is located entirely within the South Fork Wailua Basin on private land and makai of the ʻIliʻiliʻula North Wailua Ditch. The North Intake Ditch also is fed by a few small contributing streams, some of which are seasonal.

The stream diversions include the following structures:

- Diversion structure (e.g., spillway, dam, weir) across the stream
- Head gate (i.e., intake gate)
- Ditch intake/inlet (i.e., where water first enters the ditch from the diversion)
- Sluice gate to return water and sediment to the stream downstream of the diversion

These diversion structures route water into the ditch system that conveys water to the hydropower plants.

Water from the ditch and tunnel system is provided to each hydropower plant through a forebay at the downstream end of the ditch. Each forebay contains water control gates and an automated trash rack rake to remove any debris from the water prior to entering the penstock. The penstocks for both plants are above ground and run downslope to the powerhouses where they enter the turbines. Water leaves the turbines through a tailrace and enters Waiahi Stream. The water from the Upper Waiahi tailrace is discharged into Waiahi Stream mixing with the natural stream flow. Approximately 650 feet downstream of where the Upper Waiahi Hydropower Plant tailrace enters Waiahi Stream, water is diverted for the Lower Waiahi Hydropower Plant. Downstream from where the Lower Waiahi tailrace enters Waiahi Stream, water is diverted into other ditch systems through the Upper Līhuʻe and Hanamāʻulu Diversions for irrigation, a drinking water treatment facility, and recreational uses. The Upper Līhuʻe and Hanamāʻulu Diversions are not part of the KIUC Waiahi Hydropower Plant system or the ditch system that KIUC operates.

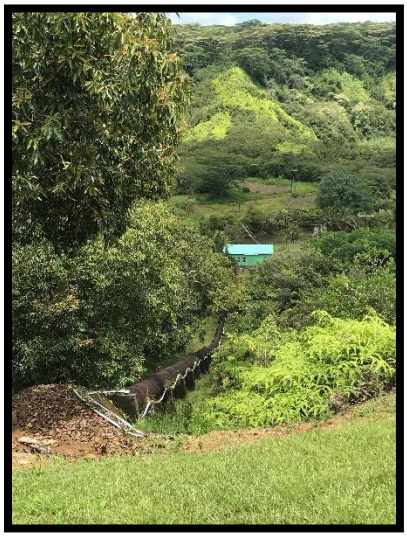
A map showing the location of the existing ditch system for the Waiahi Hydropower Plants is shown in **Figure 2**.

Weir for Gauging Station on Ditch

Head Gate

Ditch

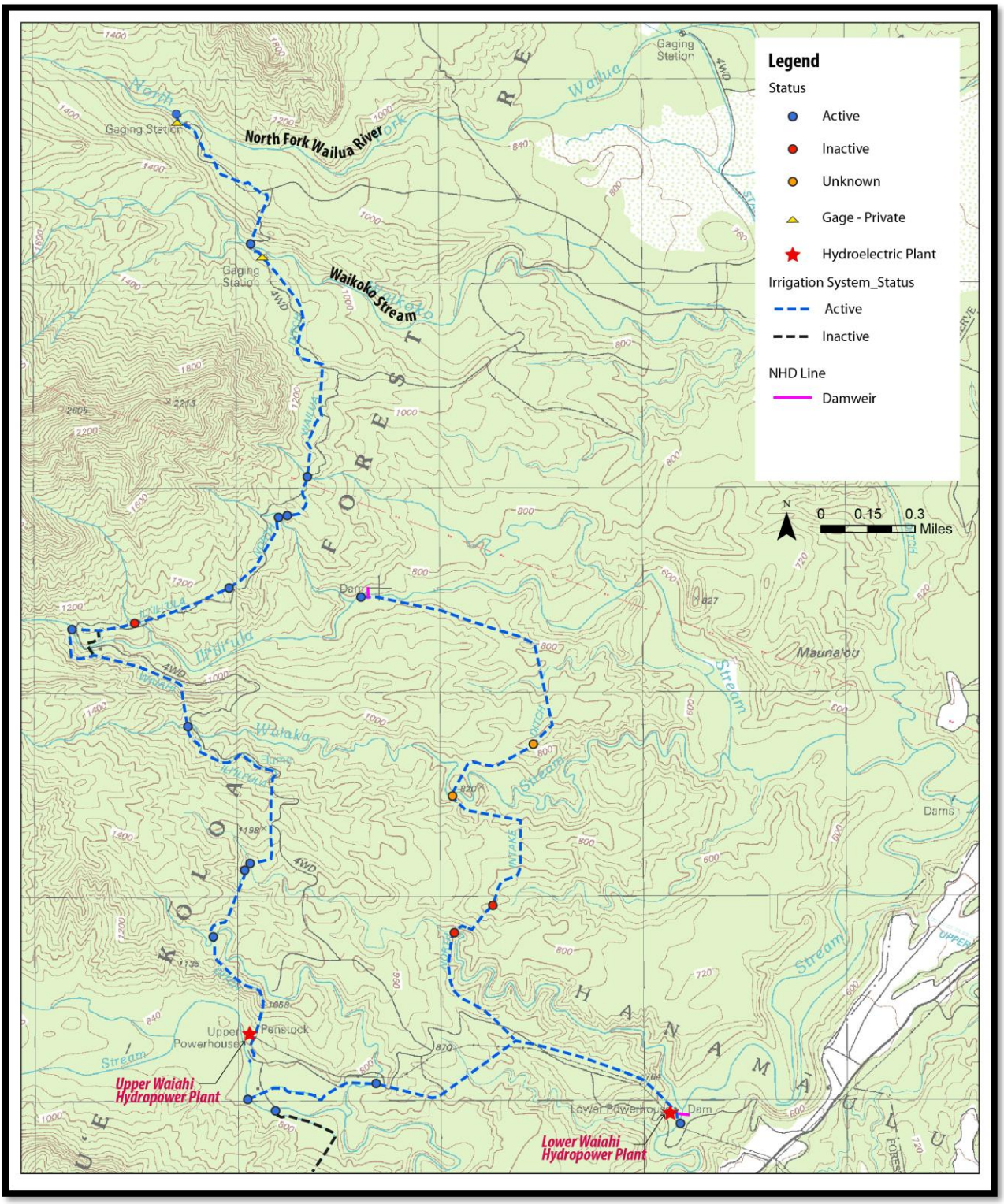
Forebay and Trash Rack



Penstock

Tailrace

Figure 2. ʻIliʻiliʻula North Wailua, Waiahi-ʻIliʻiliʻula, North, and South Intake Ditch Systems



1.5 Operation and Maintenance

1.5.1 Ditch and Diversion Maintenance

The daily operation and maintenance of the diversions and ditch system is subcontracted to a local company. The maintenance contractor reports to and takes direction from KIUC's Port Allen maintenance and operation staff.

Baseline maintenance activities happen on a regular basis with contractor personnel rotating around the sites on a weekly basis. These regularly occurring activities include the following:

- Weekly inspections of the diversions and regulating structures;
- Clearing intakes of debris;
- Keeping gage weirs clear of debris;
- Pani board and headgate adjustments as needed for IFS release and diversion volume control;
- Clearing sediment/gravel/rocks from intakes after storm;
- Inspections for the purpose of noting anything out of ordinary or in need of attention;
- Vegetation and grass control along paths, ditch banks and powerhouse areas;
- Checking and cleaning the forebay trash screens;
- Removing sections of rebar sticking up vertically and creating a tripping hazard; and
- Removing sediment from forebays and tailrace channels.

Detailed inspections are conducted on a quarterly to semi-annual basis. Scheduled maintenance is performed on an as-needed basis as issues are identified through detailed inspections, and the timing and extent of these activities is determined on a case-by-case basis. These items include, but are not limited to, the following:

- Maintaining and repairing access roads;
- Sediment removal in tunnels and open ditch sections prone to accumulation;
- Repairs to sections of ditch banks and ditch channel;
- Vegetation removal on ditches, roads, and foot paths; and
- Pani-board or control gate repairs/replacement.

Ditch cleaning and tunnel inspection being performed

Event responsive repairs and maintenance is performed on an as-needed basis and includes the following:

- Cleaning and repairs needed after storms, floods, or other high flow events; and
- Infrastructure failures such as control gate or flume issues.

A dedicated two-man crew performs the majority of the baseline maintenance work by hand. Additional crew members are added as needed for detailed inspections and scheduled maintenance. Machinery is used for some of the infrequent and event-responsive repairs that involve roadwork or debris removal in the ditch channel at intakes. Typically, a rubber-tired backhoe or tracked excavator is used for these purposes.

Cleaning accumulated gravel and rock from intake ditch at North Fork Wailua River Diversion

1.5.2 Operation Improvements

The operation and maintenance of the diversions and ditch system has undergone a number of improvements in recent years with the goal of improving stream continuity and optimizing efficiency of ditch and hydropower production. These improvements have been accomplished through several means, including but not limited to the following:

- Revising and codifying operating procedures;
- Performing more frequent detailed inspections of the ditch;
- Developing a ditch mapping system to track problems and their correction;

- Developing a prioritized project list to address long term repairs; and
- Increasing data collection on multiple points on the ditch line and at points of diversion.

Some examples of improvements that have been implemented recently in the field include the following:

- Shutting down the applicable diversions if one or both hydropower plants are offline for maintenance.
- Installation of pani-board restrictors at the ditch headgates (intakes) at the North Fork Wailua River and Waikoko Stream Diversions to limit peak flows, thereby limiting diversion volumes to ditch capacity and decreasing flood damage. The two original wooden headgates were controlled by a manually operated threaded stem hoist; however, due to age deterioration, the manual hoists stopped working properly and were removed along with rotting gate boards. The pani-board restrictors are intended as a temporary solution until new gates can be installed as part of the permanent diversion modification project as discussed in **Section 2.1.2**.
- Repairing identified sections of ditch and gates where significant leakage was occurring.

Ditch inlet restriction boards to limit diversion of stream flows

1.6 Water Use and Data Collection

1.6.1 Gaging and Data Collection

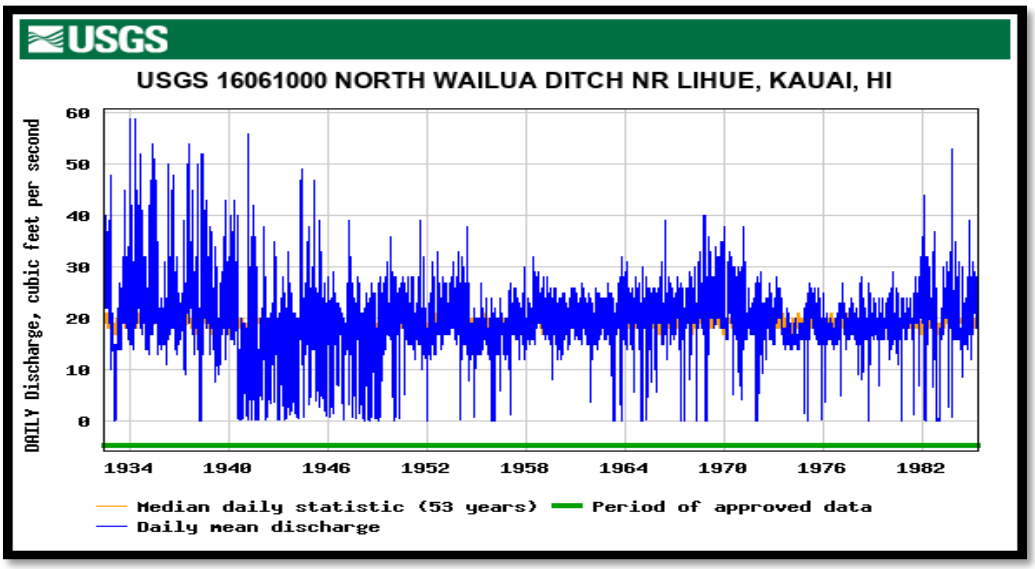
In order to establish a record of diversion volumes, the United State Geological Service (USGS) installed two gages in the ditch immediately down-ditch of the intakes at the North Fork Wailua River and Waikoko Stream Diversions, referred to in this document as the North Fork Ditch gage (USGS gage ID # 16061000) and the Waikoko Ditch gage (USGS gage ID # 16061200). These gages were operated by USGS for 53 years and 37 years, respectively, and provide records of the volume of water diverted into the ʻIliʻiliʻula North Wailua Ditch. Since these diversions are in series along the ditch, the Waikoko Ditch gage measures the sum of the water diverted and measured at the North Fork Ditch gage plus the additional water diverted

from Waikoko Stream. **Table 2** shows the flow records at the two USGS gages. **Figure 3** and **Figure 4** show the mean daily discharge at the two USGS gages. These gages were discontinued in 1985 and 2002, respectively.

Table 2. USGS Flow Records

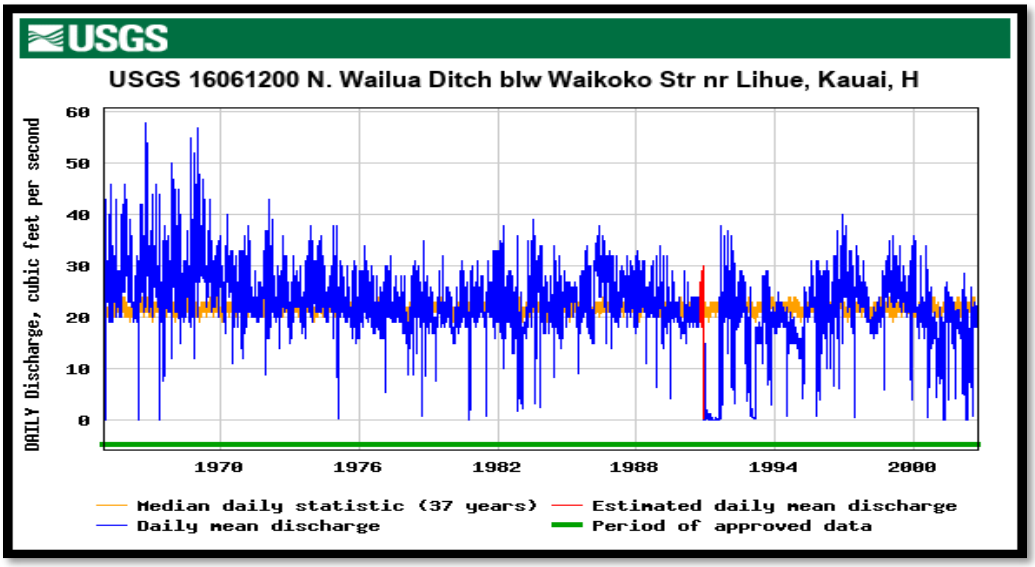
USGS Gage ID	USGS Description	Period of Record	Mean Flow (cfs)
16061000	North Wailua Ditch near Līhuʻe, Kauaʻi	07/01/1932 to 09/29/1985	19
6061200	North Wailua Ditch below Waikoko Stream near Līhuʻe, Kauaʻi	01/01/1965 to 09/29/2002	21

Figure 3. USGS Ditch below North Fork Wailua River Diversion Daily Mean Discharge



Source: USGS

Figure 4. USGS Ditch below Waikoko Stream Diversion Daily Mean Discharge



Source: USGS

Top: Measurement weir on ditch below the North Fork Wailua River Diversion

Bottom: Measurement weir on ditch below the Waikoko Stream Diverion

KIUC recommissioned these gages in 2003, began collecting reliable data in 2005, and has been maintaining and operating the stations continuously since then. Both stations are equipped with pressure transducer type stage gages with integral data loggers. The control point at North Fork Wailua River Diversion is a broad crested weir located in the ditch channel immediately downstream of the headgate. The control point at the Waikoko Stream Diversion is a six-inch hydraulic jump in the floor of the ditch located at the first tunnel entrance downstream of the headgate. Because the control point transect in the ditch at Waikoko is prone to some instability, an additional acoustic doppler flow gage has been installed at the headgate location for verification of the data collected by the transducer-based gage and to help determine the need for recalibration. Data at both the North Fork Ditch and Waikoko Ditch gaging stations is collected monthly. **Figure 5** shows the six gaging station locations on the ʻIliʻiliʻula North Wailua Ditch. The gaging site at the Lower Waiahi Hydropower Plant is not shown on this map.

Figure 5. Flow Gages Operated by KIUC on the ʻIliʻiliʻula North Wailua Ditch

Līhuʻe Plantation operated gages in both the Upper and Lower Waiahi Hydropower Plant tailraces, but these gages ceased operation long ago and no records are available. KIUC recommissioned these two gage sites in 2017 with new equipment and has been operating them continually since then. These sites are equipped with pressure transducer type stage gages with integral data loggers and are set at sharp crested weirs located in the tailrace channels. Data at both of the tailrace gaging stations is collected monthly. Calibration was completed shortly after the installation of the new equipment.

Two new ditch gages have been added at ʻIliʻiliʻula in 2018; one is located up-ditch of the ʻIliʻiliʻula Stream Diversion and one down-ditch of the ʻIliʻiliʻula Stream Diversion. These gages are acoustic doppler gages set in unrestricted tunnel sections. Reliable data collection from these stations is likely possible in late 2019.

KIUC has plans to add telemetry to the North Fork Wailua River and Waikoko Stream Diversions and Upper and Lower Tailrace gaging sites during late 2019 and early 2020 to decrease labor costs and to increase reliability through early identification of gaging problems.

Changes to the Waikoko Ditch gage transect are also being considered for the purpose of improving stability of the control point and accuracy of the collected data. This adjustment may involve the installation of a Parshall flume up-ditch of the existing control point and transducer well.

1.6.2 Recent Water Diversion

The USGS ceased operation of the North Fork Ditch gage in 1985 and the Waikoko Ditch gage in 2002 and removed USGS gaging equipment. In 2003, KIUC utilized the USGS gage locations and retrofitted new transducer-based equipment, which was calibrated by Tom Nance Water Resource Engineering. KIUC has been maintaining and operating these two gages since installation. After achieving reliable gage operations and data collection, KIUC started reporting diversion volumes to CWRM for the Waikoko Ditch gage in September 2005 and for the North Fork Ditch gage in June 2006.

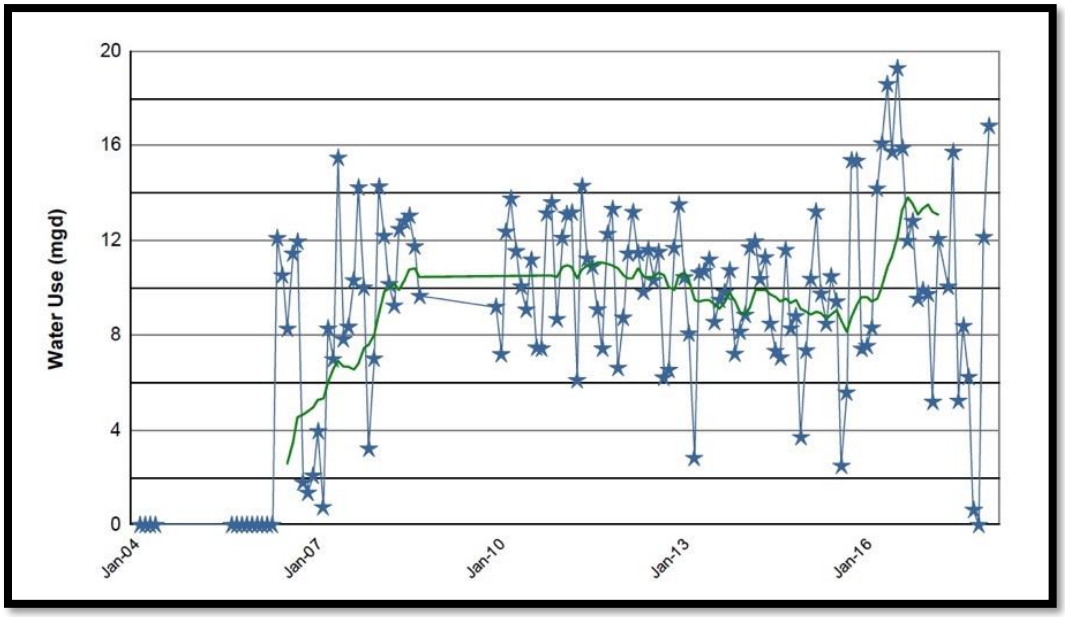
Table 3 provides information about these gages, as currently identified and recorded. Note that the unit of measurement and reporting has changed from cubic feet per second (cfs) to mgd per USGS and CWRM standards. **Figure 6** and **Figure 7** show the 12-month moving average of flows from the two gages during KIUC's period of operation.

Table 3. CWRM Ditch Flow Records Based on KIUC Reported Diversion Records

CWRM Gage ID	CWRM Gage Description	Period of Record	Mean Flow (mgd)
24	North Wailua Ditch below North Fork Wailua Stream	June 2006 to present	10.16
23	North Wailua Ditch below Waikoko Stream	September 2005 to present	13.45

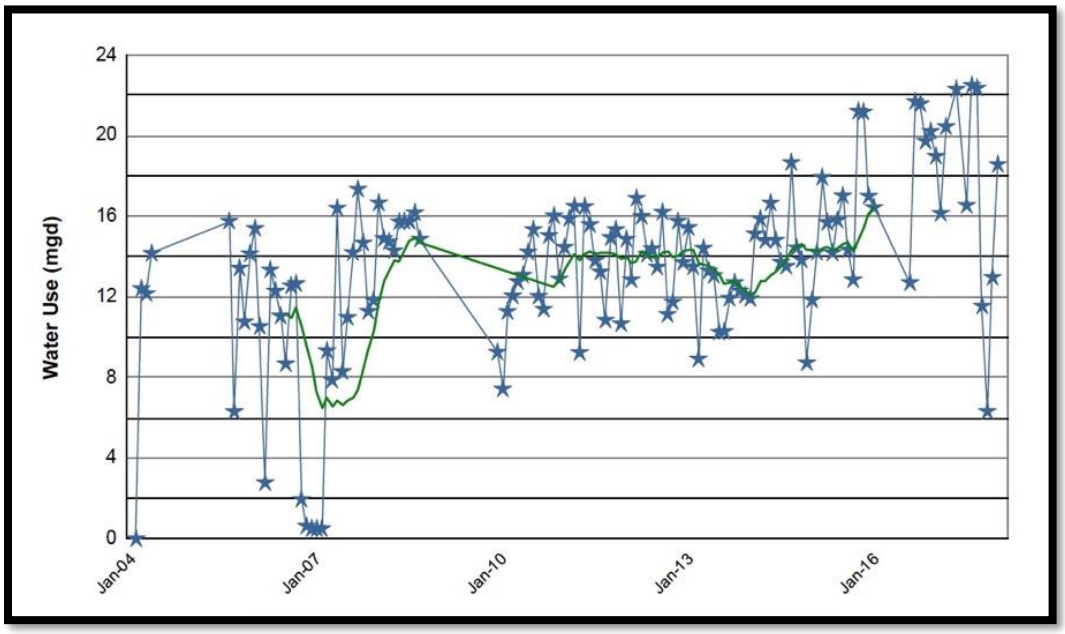
Source: CWRM

Figure 6. Ditch below North Fork Wailua River Diversion, 12-Month Moving Average



Source: CWRM Diversion Records

Figure 7. Ditch below Waikoko Stream Diversion, 12-Month Moving Average



Source: CWRM Diversion Records

1.6.3 Gage Accuracy and Calibration

Stream gaging stations are based upon a well proven methodology that measures the depth of water flowing through an identified stable hydraulic control point. Hydraulic formulas are often used to determine the theoretical flow through the control point and then the specific formula is trued with actual measurements taken in the field at varied flows to develop an accurate and site-specific rating curve. The rating curve is a mathematical formula that is used to convert the measured stage (water height elevation) to a corresponding volumetric water value.

Between 2005 and 2017 the gages utilized rating curves developed by Tom Nance Water Resources as part of the gage reactivation process. In June of 2017, KIUC engaged Hydrology Northwest to recalibrate both gages to verify accuracy and add confidence to the data being used for the environmental studies associated with the diversions and ditch system. The work resulted in improvements to the Waikoko Ditch gage transect and weir and the creation of new rating curves for each gage.

P. Rittmueller of Hydrology Northwest taking flow measurements as part of the Waikoko gage calibration, 06/01/2017

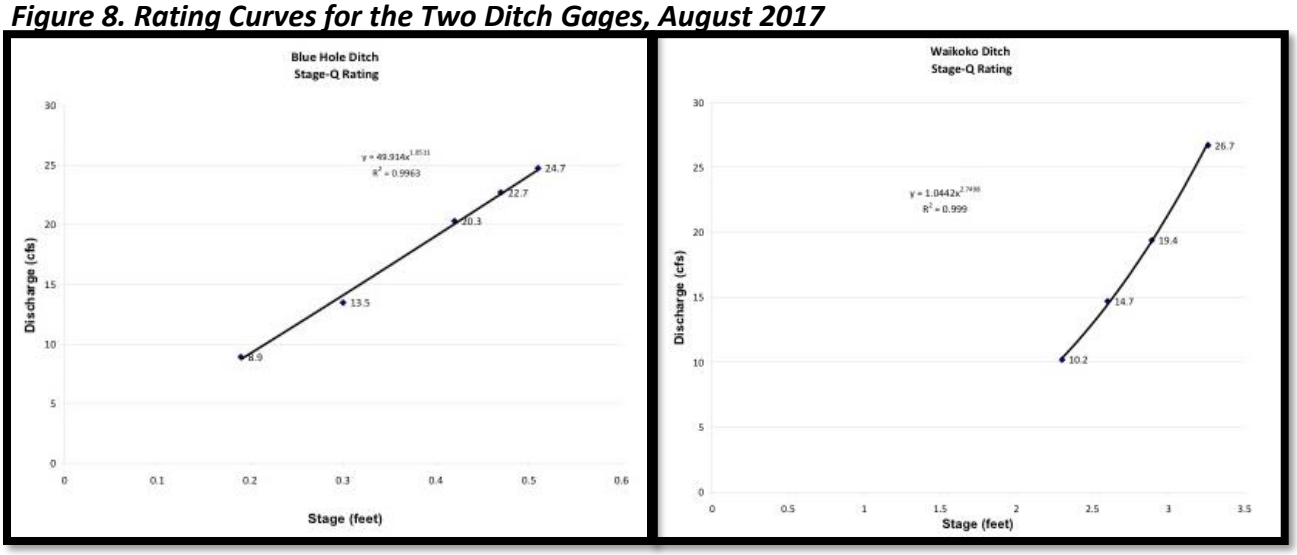
Ditch discharge was measured at three to five different flows at the best cross section available for taking an accurate measurement at each site. At all locations an engineer's tape was placed above the water, perpendicular to the flow to accurately locate specific measuring points

(stations). A Swoffer photo optic current meter and Stevens topset wading rod was used to measure depth and average velocity of water at each selected station with each measurement being generally 0.3 feet apart. Information from the field data sheets was entered into a spreadsheet designed to compute total discharge.

All discharges and corresponding staff gage heights (stage) for each location were recorded in a table and the corresponding pairs of stage and discharge were analyzed for a mathematical relationship that most accurately predicted the observed data points. The criteria for selecting the best equation were a combination of the R^2 value and how accurately the equation predicted the measured flows.

All of the rating curves for this calibration effort were classified as good to excellent for the range of flows measured based on R^2 values of 0.99+ in all cases and individual discharges predicted within a 5% range of measured discharges. These results, shown in **Figure 8**, provide a high degree of confidence in the data obtained from these ditch flow gages.

Figure 8. Rating Curves for the Two Ditch Gages, August 2017



Source: Hydrology Northwest, 2017

1.6.4 Post-Calibration Detailed Diversion Records

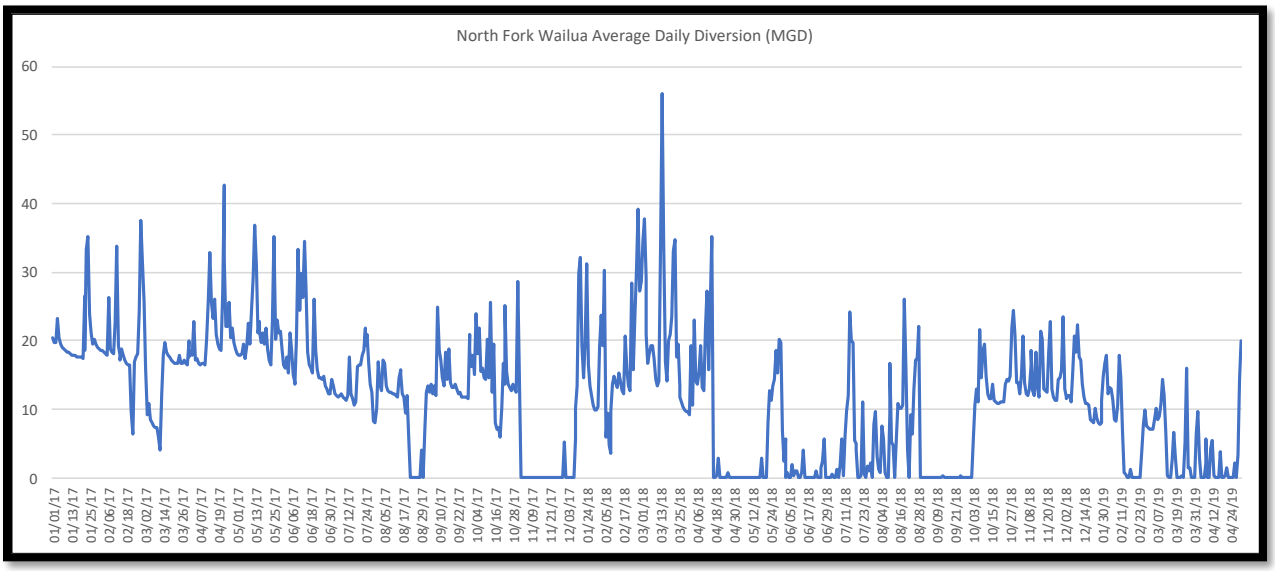
Starting in January 2017, a more detailed analysis of the diversion volumes, ditch operations, and water use was undertaken utilizing the calibrated ditch flow data. **Table 4**, **Figure 9**, and **Figure 10** summarize the average daily diversion amounts at both gages from January 2017 through April 2019.

Table 4. Daily Ditch Flow Record Summary, January 2017 to April 2019

CWRM Gage ID	Gage Description	Period of Record	Minimum Flow (mgd)	Maximum Flow (mgd)	Average Flow (mgd)
24	Ditch Below NF Wailua	01/01/17 to 04/30/19	0.0	56.0	11.7
23	Ditch Below Waikoko	01/01/17 to 04/30/19	0.2	44.0	14.2

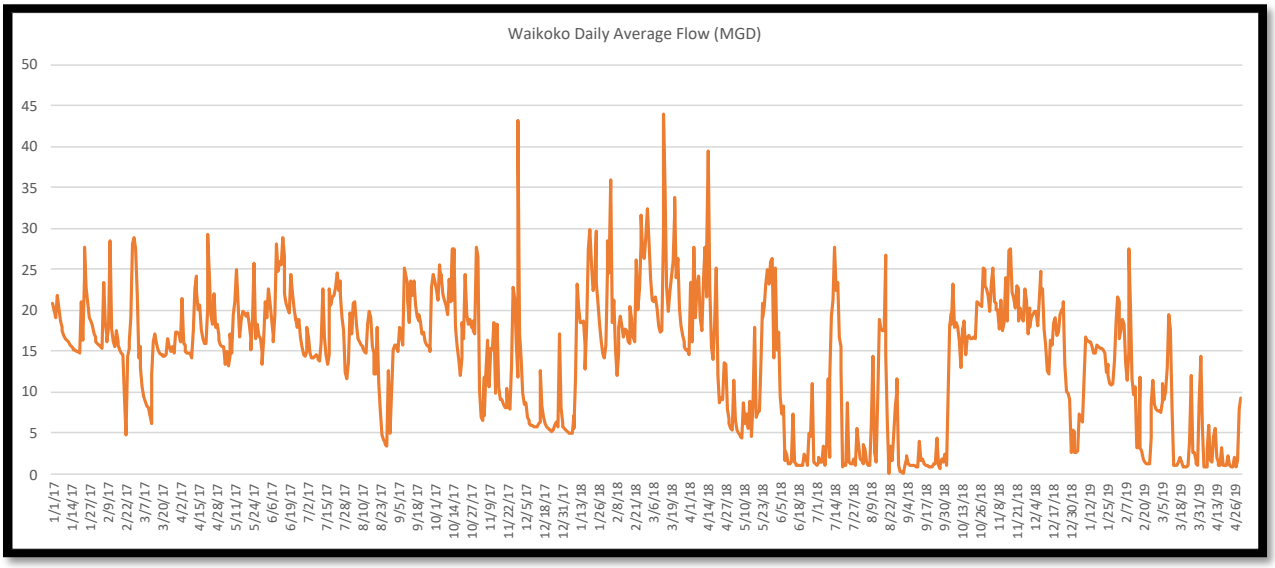
Source: Joule Group, LLC

Figure 9. Daily Ditch Flows at North Fork Ditch Gage, January 2017 to April 2019



Source: Joule Group, LLC

Figure 10. Daily Ditch Flows at Waikoko Ditch Gage, January 2017 to April 2019



Source: Joule Group, LLC

1.6.5 Historic versus Recent Diversion Volumes

In general terms, there has been a decrease in overall diversion volumes of 17.7% and 9.4% at the North Fork and Waikoko Ditch gages, respectively, between the historic plantation-era diversion records and the KIUC-era recent diversion records.

To understand how plantation-era diversion volumes compare with KIUC-era diversion volumes at the Waikoko Ditch gage, two data sets were used that have combined diversion flow from the North Fork Wailua River and Waikoko Stream Diversions. The USGS data represents daily average flow over a relatively long period of record (1965 to 1985) when the plantation was operating the system. The KIUC data set as reported to CWRM represents monthly average data for between 2006 and 2019. While there are time period differences in the data sets, they can be used to reasonably compare average diversion volumes for each era. The data sets are shown **Table 5**.

Table 5. Comparative Daily Ditch Flow Record Summary

CWRM Gage ID	Gage Description	Operator	Period of Record	Average Flow (cfs)	Average Flow (mgd)
23	Ditch Below Waikoko	KIUC	06/2006 to 04/2019	20.9	13.6
16061200	USGS North Wailua Ditch below Waikoko Stream near Līhuʻe, Kauaʻi	Plantation	01/01/65 to 09/28/85	23.2	15.0

Source: USGS and CWRM

1.6.6 Water Use at the Waiahi Hydropower Plants

The water diverted from North Fork Wailua River and Waikoko Stream is used by KIUC for renewable energy generation at the 700 kW Upper Waiahi Hydropower Plant and the 800 kW Lower Waiahi Hydropower Plant. As noted in above sections, the Upper Waiahi Hydropower Plant is fed directly by the ʻIliʻiliʻula North Wailua Ditch, which accumulates diverted water from three primary sources and six smaller sources along its path from the North Fork Wailua River to the Upper Waiahi Hydropower Plant forebay. While the exact amounts of the water contribution vary depending upon precipitation patterns, **Table 6** shows an estimated distribution of contribution to the ʻIliʻiliʻula North Wailua Ditch by source as calculated by CWRM. As generally described in the CWRM Staff Interim IFS Recommendation[3], both historic USGS gage records and precipitation data were combined with ditch flow records to estimate the natural stream flow at the points of diversion and the contribution of the major diversions to the total ditch flow.

Table 6. Distribution of Contributing Sources to the Upper Waiahi Hydropower Plant

CWRM Diversion ID	Diversion Description	CWRM Estimated Contribution
716	North Fork Wailua	50%
713	Waikoko Stream	17%
715	Iliiliula Stream	33%
multiple	6 Minor Intakes – 2 perennial and 4 intermittent	n/a

[3] CWRM Staff Submittal – IIFS Recommendation Waikoko and North Fork Wailua Streams 08/21/18 pp 11-12

A transducer was installed in the tailrace at the Upper Waiahi Hydropower Plant in March 2017 and subsequently calibrated by Hydrology Northwest in June 2017. Hourly and daily flow values have been recorded since March 24, 2017. **Table 7** shows the minimum, maximum, and average operational flows for the period of record.

Table 7. Daily Upper Waiahi Hydropower Plant Flow Summary

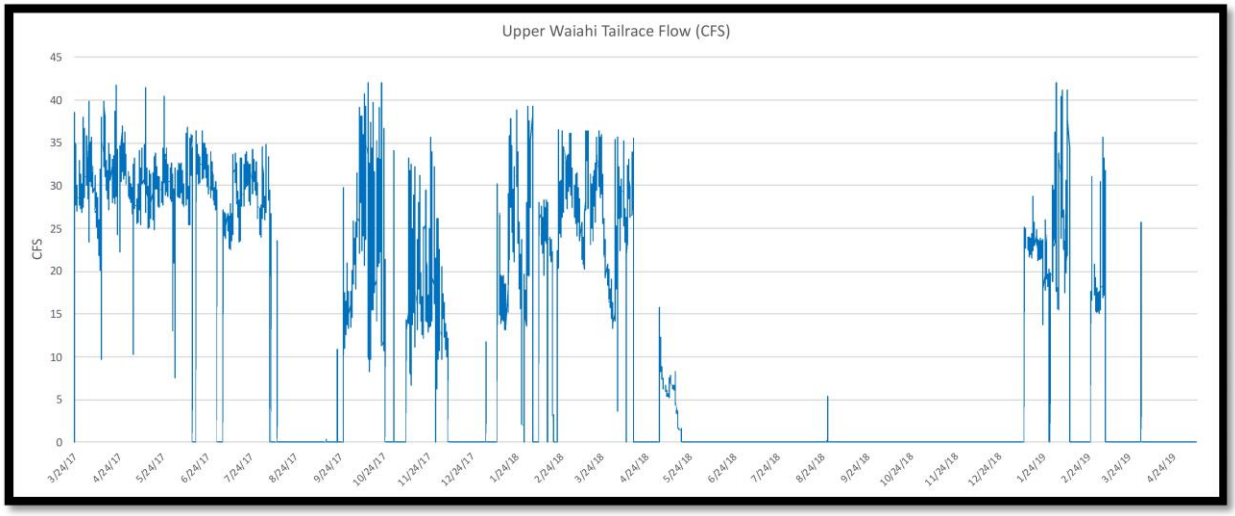
Gage Description	Period of Record	Minimum Flow (mgd)	Maximum Flow (mgd)	Average Operational Flow (mgd)
Upper Waiahi Hydropower Plant Tailrace	03/24/17 to 04/30/19	0.0	27.3	19.1

Source: Joule Group, LLC

When the ditch water is discharged from the Upper Waiahi Hydropower Plant it flows through the tailrace channel and into Waiahi Stream.

Figure 11 shows a plot of hourly discharges from the Upper Waiahi Hydropower Plant. The considerable variability is immediately evident, which is a function of precipitation and resultant ditch flow. Also apparent are the periods of zero flow, which is a function of outages for repairs, such as in the third and fourth quarters of 2018, or flood induced blockage of the intake, such as the mid-April 2018 event.

Figure 11. Upper Waiahi Hydropower Plant Water Use - Hourly Record



Source: Joule Group, LLC

As mentioned above, the first diversion and intake for the Lower Waiahi Hydropower Plant is located on Waiahi Stream approximately 650 feet downstream of where discharge from the Upper Waiahi Hydropower Plant enters the natural stream channel. Thus, water diverted at this location is a combination of natural stream flow in Waiahi Stream and water discharged from the ʻIliʻiliʻula North Wailua Ditch from North Fork Wailua River, Waikoko Stream, and ʻIliʻiliʻula Stream plus the smaller contributions. Diversions on Waiahi and ʻIliʻiliʻula Streams provide the primary sources of water for the Lower Waiahi Hydropower Plant with an additional five small contributors, some of which are seasonal. Water from the ʻIliʻiliʻula Stream Diversion along with smaller contributors is delivered through the North Intake Ditch, which intersects with another ditch ending at the forebay to the Lower Waiahi Hydropower Plant. The distribution of the contributing ditch flows to the North Intake Ditch has not yet been

documented. Once the water passes through the Lower Waiahi Hydropower Plant it is returned through the tailrace to Waiahi Stream.

A transducer was installed in the tailrace at the Lower Waiahi Hydropower Plant in March 2017 and subsequently calibrated by Hydrology Northwest in June 2017. Hourly and daily flow values have been recorded since March 24, 2017. **Table 8** shows the minimum, maximum, and average operational flows for the period of record. It should be noted that the Upper Waiahi Hydropower Plant was offline for major repairs for a portion of the period of record, at which time water was not diverted from the North Fork Wailua River and Waikoko Stream, and there was no flow through the Upper Waiahi Hydropower Plant. As noted above, water volumes available for diversion from Waiahi Stream are impacted by the volume of water being discharged at the Upper Waiahi Hydropower Plant tailrace.

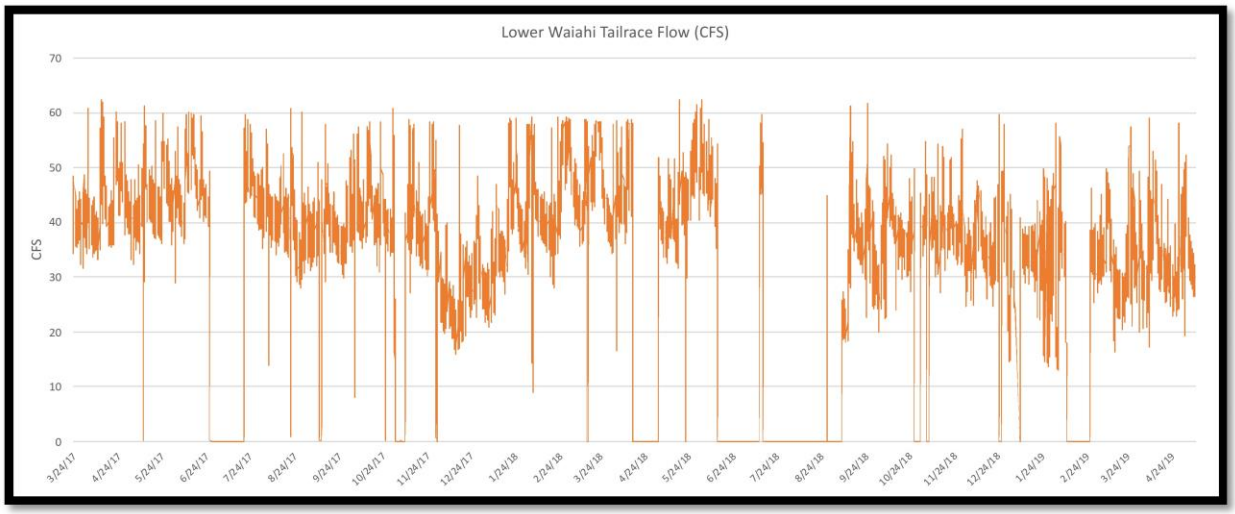
Table 8. Daily Lower Waiahi Hydropower Plant Flow Summary

Gage Description	Period of Record	Minimum Flow (mgd)	Maximum Flow (mgd)	Average Operational Flow (mgd)
Lower Waiahi Hydropower Plant Tailrace	03/24/17 to 04/30/19	0.0	40.5	25.6

Source: Joule Group, LLC

Figure 12 shows a plot of hourly discharges from the Lower Waiahi Hydropower Plant. Like the Upper Waiahi Hydropower Plant plot in **Figure 11** there is considerable variability. This is a function of precipitation and a few periods of zero flow during outages for repairs, such as in July 2017 and August 2018.

Figure 12. Lower Waiahi Hydropower Plant Water Use – Hourly Record



Source: Joule Group, LLC

1.7 Instream Flow Standards

In Hawaiʻi, CWRM has the responsibility of setting Instream Flow Standards (IFS) on individual streams, as needed, in order to protect the public interest in the waters of the State. Through the IFS process, CWRM has the role of weighing "the importance of the present or potential instream values with the importance of the present or potential uses of water for non-instream purposes, including the economic impact of

restricting such uses" (Code 174C-71(2)). The Code defines an IFS as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses" (HAR 174C-3). Instream uses generally include the following:

- Maintenance of fish and wildlife habitats,
- Outdoor recreational activities,
- Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation,
- Aesthetic values such as waterfalls and scenic waterways,
- Navigation,
- Instream hydropower generation,
- Maintenance of water quality,
- The conveyance of irrigation and domestic water supplies to downstream points of diversion, and
- Protection of traditional and customary Hawaiian rights.

Non-instream uses generally refer to water diverted or removed from the stream channel for domestic, agricultural, and industrial purposes. Title to water resources is held in trust by the State for the benefit of its people. Pursuant to In re Water Use Permits, 94 Hawaiʻi 97, 9 P.3d 409 (2000), and In re Waiʻola 0 Molokaʻi, Inc., 103 Hawaiʻi 401, 83 P.3d 664 (2004) the Hawaiʻi Supreme Court has identified four public trust purposes with respect to water (CWRM, 2018):

- Water in its natural state,
- Water for traditional and customary practices,
- Water for domestic uses, and
- Water for DHHL.

The hydroelectric use of water allows utility companies to provide clean energy to domestic and commercial users. This method of energy production also supports Hawaiʻi's Clean Energy Initiative, which sets goals for the state to achieve 100% clean energy by 2045 coming from locally generated renewable sources. Further, those hydroelectric projects that return water to the same stream or other body of water from which it was drawn are considered non-consumptive. Although hydroelectric projects are not an identified public trust use of State waters, the public trust concerns will be addressed in the processing of the water lease applications under HRS Section 171-58.

The current interim IFS for streams on Kauaʻi were established by way of HAR 13-169-48, which became effective in December 1987 and reads in part as follows:

> "<u>Interim Instream flow standard for Kauaʻi.</u> The Interim Instream Flow Standard (IIFS) for all streams on Kauaʻi, as adopted by the commission on water resource management on June 15th, 1988, shall be the amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard…"

CWRM staff initiated an assessment of hydrology, instream and non-instream uses in the Wailua watershed in 2016 and has approached addressing the IFS for streams in the watershed in phases starting

with the North Fork Wailua River and Waikoko Stream at the point of the North Fork Wailua River and Waikoko Stream Diversions.

In August 2018, CWRM held their meeting on Kauaʻi and the agenda included amending the interim IFS for the Surface Water Hydrologic Unit of Wailua: North Fork Wailua River and Waikoko Streams. The CWRM staff submittal for this meeting, a copy of which is included in **Appendix A**, included a proposed IFS for North Fork Wailua River at a location downstream of the North Fork Wailua River Diversion and Waikoko Stream at the Waikoko Stream Diversion. The proposed IFS for North Fork Wailua River approximately 500 yards below the North Fork Wailua River Diversion is 4.0 mgd, which is composed of 3.5 mgd of restoration at the diversion plus approximately 0.5 mgd in natural seepage gain. The location of the IFS is consistent with the location of a stream gage on the North Fork Wailua River installed and operated by CWRM ("Kauaʻi 2-191" gage). The proposed IFS for Waikoko Stream at the diversion is 0.8 mgd. The proposed IFS values are shown in **Table 9**.

Table 9. Staff Recommended IFS Quantities

CWRM Diversion ID	Diversion Description	CWRM Recommended IIFS	Historic Diversion Volume Limitation (avg/yr)
716	North Fork Wailua	3.5 mgd (5.4 cfs) restoration	incl. in 713
713	Waikoko Stream	0.8 mgd (1.3 cfs)	14.2 mgd

Source: CWRM

The following subsections provide information on the following:

- Implications of the IFS and Resultant Water Availability
- Proposed Implementation of the CWRM Staff Recommended IFS
- Compliance and Monitoring
- Hydro Energy Production
- IFS Impact to Energy Production

Additional information, including the calculations used to determine impacts is provided in **Appendix B**.

1.7.1 Implications of the IFS and Resultant Water Availability

There are no stream flow records for the North Fork Wailua River or Waikoko Stream in the vicinity of the diversion locations. However, accurate long-term measurement records exist for the ʻIliʻiliʻula North Wailua Ditch below the North Fork Wailua River and Waikoko Stream Diversions as shown in **Table 10**.

Table 10. USGS Ditch Flow Records

USGS Gage ID	USGS Description	Period of Record	Mean Flow
16061000	North Wailua Ditch near Līhuʻe, Kauaʻi	07/01/1932 to 09/29/1985	12.21 mgd (18.9 cfs)
16061200	North Wailua Ditch below Waikoko Stream near Līhuʻe, Kauaʻi	01/01/1965 to 09/29/2002	13.96 mgd (21.6 cfs)

Source: USGS

Use of this ditch flow data to understand natural stream flow at the point of diversion is problematic because natural flows which are above ditch capacity pass over the diversion spillway and all leakage or sluiced flows which are not diverted are not recorded. On typical plantation style irrigation diversions the ditch invert (floor elevation) is well below the spillway crest (overflow section in the stream channel) in

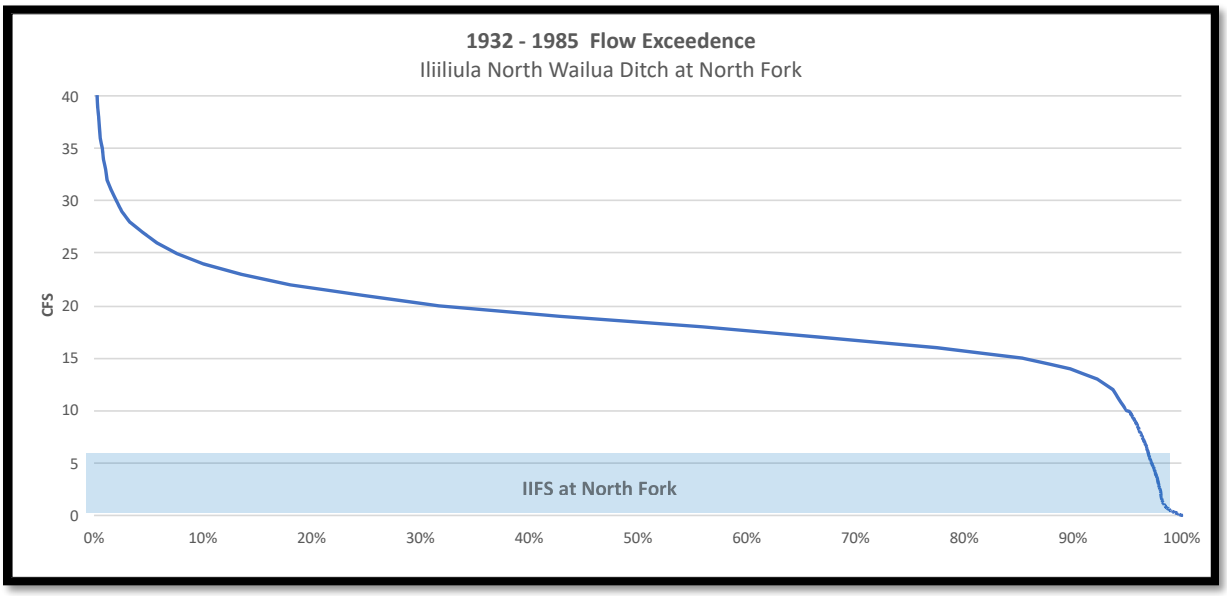
the interests of capturing as much water as possible for the farming operations during dry periods. For this reason, we can assume that the ditch flow records roughly represent natural stream flow during low flow periods, but do not reflect stream flow during moderate and high flow periods that were above the capacity of the ditch. In the case of the ʻIliʻiliʻula North Wailua Ditch, the hydraulic capacity is approximately 30 mgd (46.4 cfs). While diversion values have been recorded above that, experience indicates that diverted flows greater than 30 mgd cannot be transported through the full length of the ditch. Diversion values recorded over 30 mgd are reflections of flood events that overtop the ditch channel in various places and do not reflect the true carrying capacity of the ditch.

One of the most common tools for visualizing and understanding stream flow characteristics is a flow duration curve (FDC), which charts the percent of time that a given flow is exceeded. **Figure 13** and **Figure 14** show FDCs that were developed using USGS's period of record data for daily average flow at the gages listed in **Table 10**. The median flow is equal to 50% on the FDC (Q50). The IFS restoration value of 3.5 mgd (5.4 cfs) is equal to about 97% on the FDC, meaning that 3% of the time the natural stream flow was less than the IFS.

In the simplest terms, the FDC can be used to determine the impact to available ditch flow. In essence, everything below the blue FDC plot line in **Figure 13** represents water that was diverted during the period of record. The IFS can be represented graphically as a slice across the bottom of the FDC plot, as shown by the blue shaded area. Analysis of the USGS 16061000 average daily data shows that the IFS, if applied during the 1932 to 1985 period of record, would have resulted in as much as a 28% reduction in diverted water at the North Fork Wailua River Diversion #716.

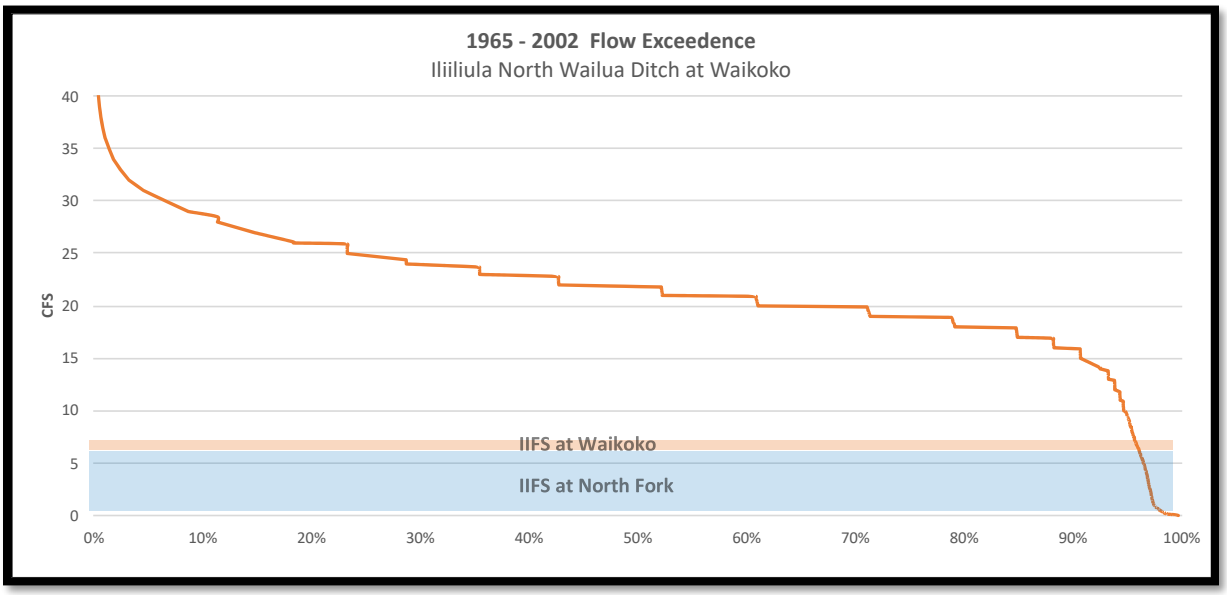
The overall appearance and characteristic of the Waikoko Gage 16061200 FDC (**Figure 14**) is similar to the North Fork Wailua Ditch gage FDC with incrementally higher values due to the water added by Waikoko Stream. As is shown in **Table 10**, the mean flow at the ditch gage below the Waikoko Stream Diversion is 2 cfs higher at 21 cfs versus 19 cfs, meaning an average of 2.7 cfs was added to the ditch from Waikoko Stream during the period of record. Analysis of the USGS 16061000 average daily data shows that the IFS, if applied to the diverted volumes during the 1965 to 2002 period of record, would have also resulted in as much as 28% reduction in diverted water in the ditch below the Waikoko Stream Diversion #713.

Figure 13. Flow Exceedance at USGS 16061000 Ditch Gage



Source: CWRM

Figure 14. Flow Exceedance at USGS 06061200 Ditch Gage



Source: CWRM

1.7.2 Proposed Implementation of the CWRM Staff Recommended IFS

Accurate and reliable release of the IFS at the diversions is not possible with the legacy plantation diversion structures without structural and dimensional modifications due to the fact that they were designed to divert all stream flow during low flow periods.

KIUC is proposing to address IFS requirements in two steps:

1. Immediate partial restoration of flow within one year as requested by BLNR in its December 2017 revocable permit holdover approval.
2. Permanent IFS compliance solution through structural modifications that ensure both reliable flow release and mauka-to-makai connectivity.

The immediate partial restoration flow has been completed and involved utilizing existing infrastructure to release the IFS volumes back into the stream channel a short distance downstream of the diversion structures. This method was selected because it was the most effective, quickest way to implement the IFS and did not require permits, which would necessitate a significant time delay. These changes were proactively implemented in May 2018 on the North Fork Wailua River and June 2018 on Waikoko Stream, which was ahead of the BLNR one-year allowance. Additional changes were implemented in January 2019 in compliance with reduced diversion volumes imposed by the BLNR in the 2019 revocable permit holdover approval.

Looking downstream at IFS release at North Fork Wailua River with stream channel on left, ditch to right, and IFS flow release visible in the center and bottom left

A sluice gate is located in the ditch channel approximately 100 feet down-ditch of the North Fork Wailua River Diversion weir. The sluice gate has an invert elevation that is three feet lower than the spillway weir and is the lowest point in the ditch inlet. This gate is used for flushing accumulated sediment out of the ditch inlet and also to dewater the ditch if maintenance activities need to be done in the dry. The sluice gate's steel leaf was modified with an opening cut at the bottom to release approximately 6 cfs back into the stream channel below the diversion weir. The method is reliable at all stream flow levels since the opening is at the lowest point and water flows back into the stream channel from the sluice gate opening before any water flows down-ditch. The released water rejoins the stream channel approximately 100 feet downstream of the spillway.

IFS release at North Fork Wailua River Diversion through sluice gate

A sluice gate is also located in the ditch channel approximately 120 feet down-ditch of the Waikoko Stream Diversion weir. This sluice employs stop logs in lieu of a slide gate and has an invert elevation that is 2.5 feet lower than the spillway weir making it the lowest point in the ditch inlet. The sluice is used for flushing accumulated sediment out of the ditch inlet and also to dewater the ditch if maintenance activities need to be done in the dry. A spacer was inserted below the pani boards (stoplogs) to create a slot at the bottom to release approximately 2 cfs back into the stream channel below the diversion weir. The method is reliable during all stream flows, since the opening is at the lowest point and water flows from the sluice gate opening back into the stream channel before any water flows down-ditch. The released water rejoins the stream channel about 200 feet downstream of the spillway.

The actual release volumes have been checked multiple times by KIUC's staff and subcontractors and changes in the sluice gate release opening dimensions have been made twice since the initiation of flow releases at these points. At the Waikoko Stream Diversion, the opening was decreased slightly after it was discovered that 6 cfs (4 times the IFS) was being released. At the North Fork Wailua River Diversion, the opening was increased when it was determined that slightly less than the proposed IFS was measured at the CWRM gage during a low stream flow period in January 2019.

Looking downstream at IFS release at Waikoko Stream, with stream channel about 100 feet behind the photographer, the ditch to the right, and IIFS flow release flowing left towards stream source

The permanent solution for IFS compliance involves reconstruction of the existing diversions using a design that retains the IFS requirement in the stream versus diverting streamflow into the ditch inlet and then returning it to the stream. The details of the new structure designs are contained in **Section 2.1.2**.

1.7.3 Compliance and Monitoring

Compliance monitoring of the proposed IFS releases on the North Fork Wailua River is being accomplished by CWRM using a gaging station installed in February 2018 approximately 500 yards downstream of the diversion. This gage features real time telemetry and is identified as the CWRM Kauaʻi 2-191 gage. The period of record is July 25, 2018 until present. The gage information is accessible online[4].

Compliance monitoring on Waikoko Stream is being accomplished by a new stream gage and data logger installed by CWRM in March 2019 approximately 300 feet downstream of the Waikoko Stream Diversion. Real time telemetry is not present at this site and records are not yet available from this gage.

Since completion of the immediate partial restoration in March 2018, KIUC has been taking spot measurements at the CWRM gage locations on both the North Fork Wailua River and Waikoko Stream to verify compliance and make any flow adjustments necessary at the sluice gate release points to ensure compliance.

KIUC has been in compliance with the IFS releases as verified by the CWRM gage. **Figure 15** and **Figure 16** shows a chart of the entire record from gage Kauaʻi 2-191 since its installation with record high and low flows highlighted. The data shows flows well in excess of the 6.2 cfs recommendation with many events exceeding 200 cfs. Analysis of the data shows an average flow of 132 cfs for the period of record from July 25, 2018 until June 8, 2019.

[4] *CWRM Kauai 2-191 NF Wailua blw Blue Hole*. User Name: public; Password: public

CWRM stream gage “Kauaʻi 2-191” downstream of the North Fork Wailua River Diversion. The staff gage and pipe containing the transducer on the right bank are visible within the red circle.

Figure 15. CWRM stream gage "Kauaʻi 2-191" with Low Flows Highlighted in Red Circle

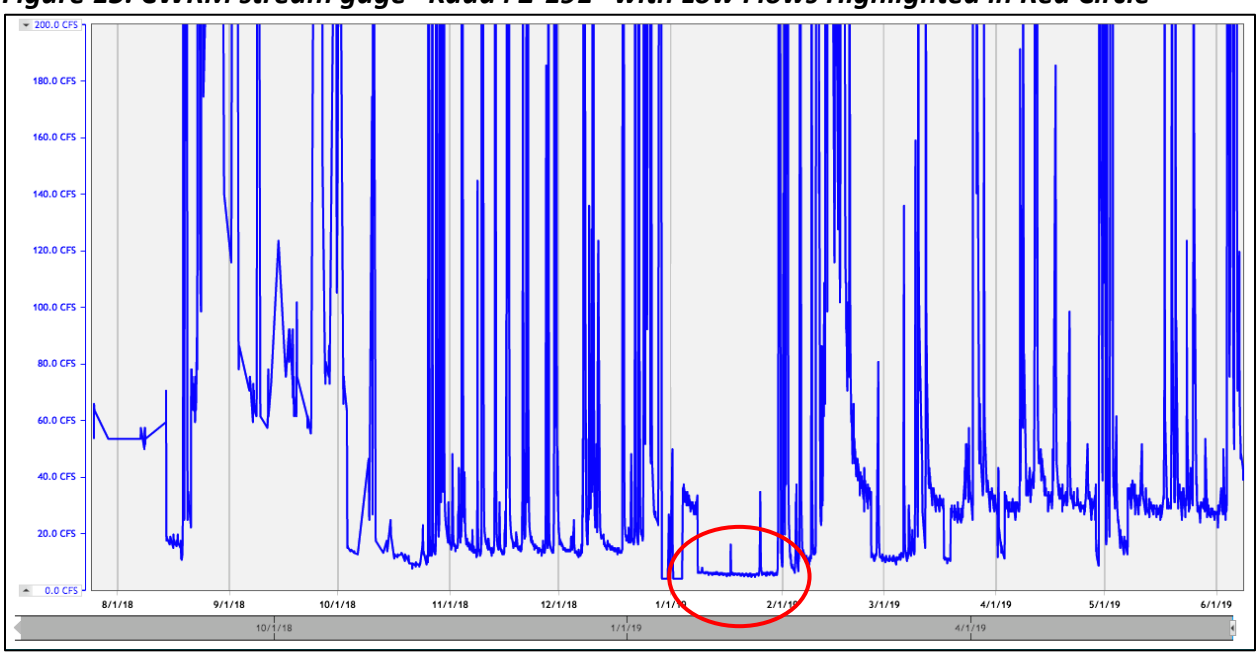
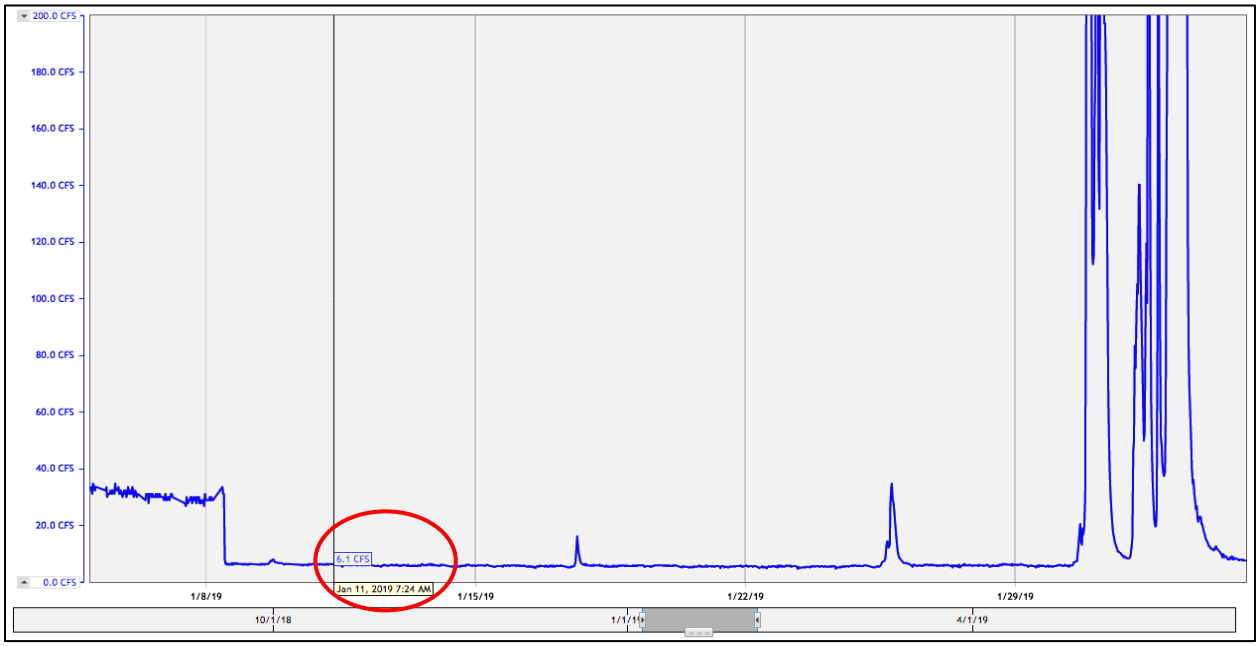


Figure 16. CWRM stream gage "Kauaʻi 2-191" with Low Flow Highlighted in Red Circle



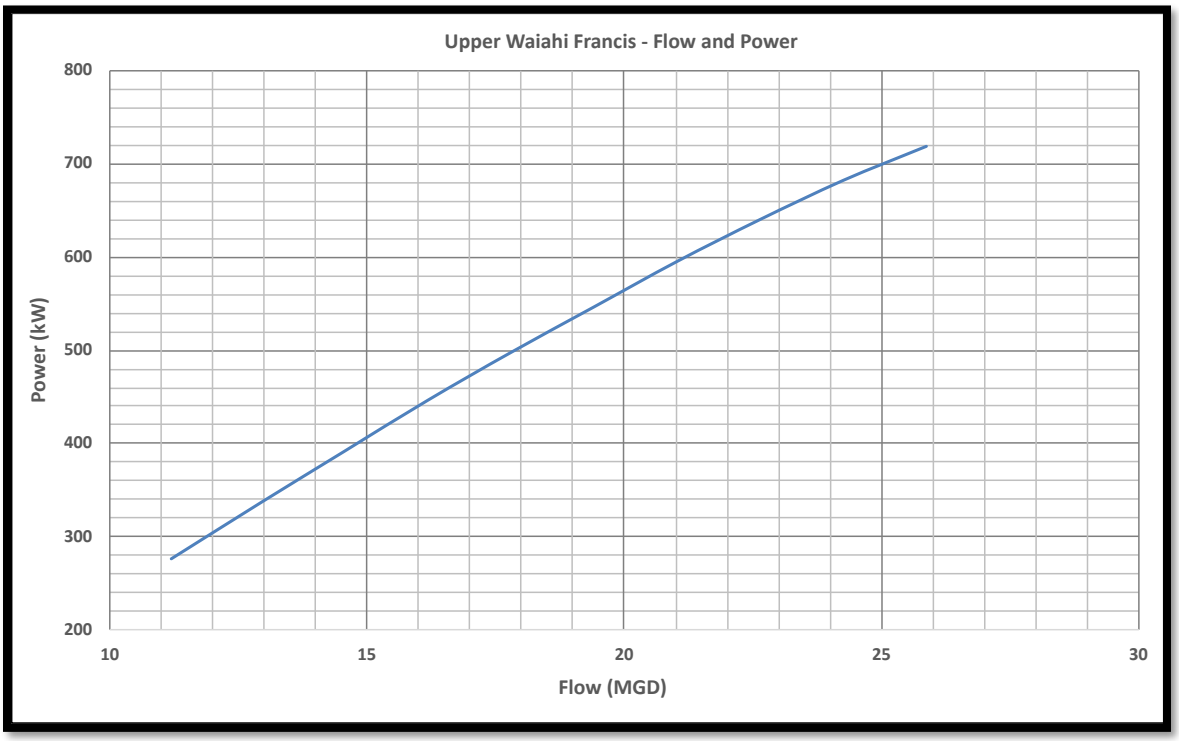
1.7.4 Hydro Energy Production

As mentioned previously, KIUC's use of the diverted water is hydropower generation. This is accomplished through two legacy hydroelectric plants, arranged in series at the end of the ʻIliʻiliʻula North Wailua Ditch and North Intake Ditch.

Francis turbines are well suited for the head (elevational drop) available at the Waiahi Hydropower Plant sites and generally operate at high efficiencies, which maximizes production. However, Francis turbines are limited in their ability to "turn down" or run at fractional outputs. At lower flows (e.g., 40% of design), the efficiency drops considerably, and cavitation will often occur. This is typically not a problem for hydropower plants on irrigation systems, which were sized intentionally in relation to their water sources to flow reliably at 50% to 100% of their capacity.

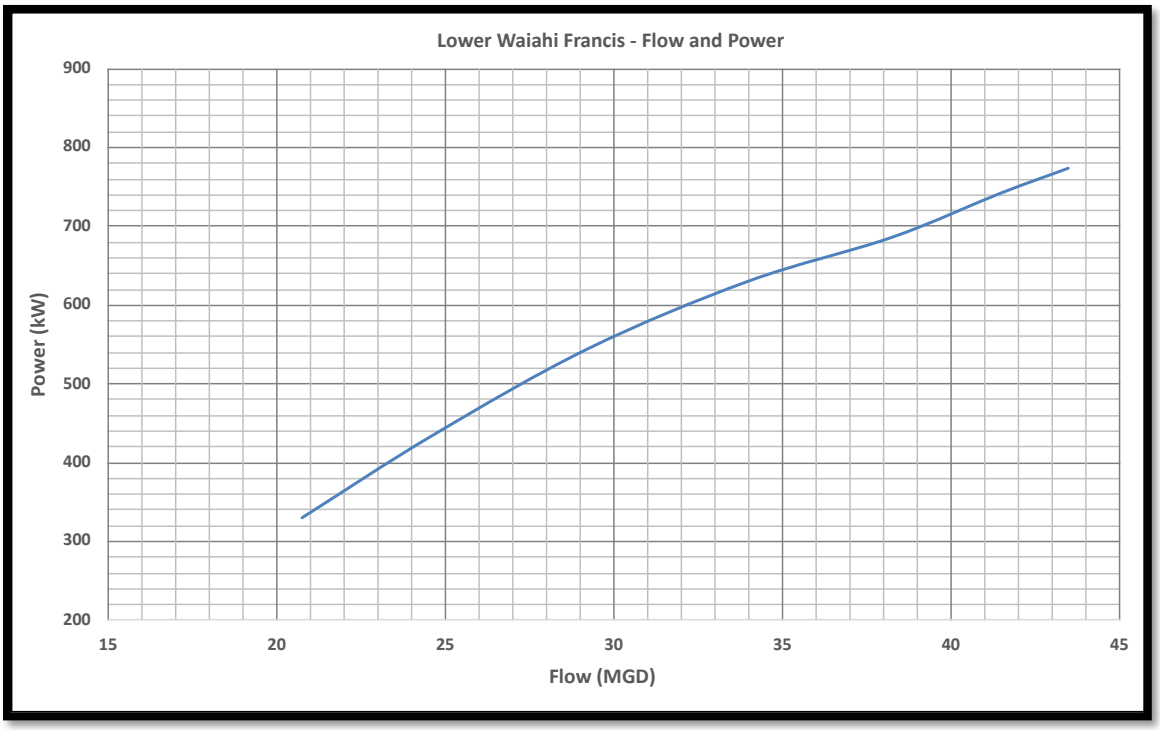
The performance curves shown in **Figure 17** and **Figure 18** were developed using information derived from a combination of testing at the Upper and Lower Waiahi Hydropower Plants and manufacturer's data. Properly designed and installed, these units operate efficiently over the expected range of flows available through the respective ditches. These expected flows were founded on hydrology studies conducted prior to construction and experience with irrigation systems and agricultural needs on Kauaʻi.

Figure 17. Upper Waiahi Hydropower Plant Generating Unit Performance Curve



Source: Joule Group, LLC

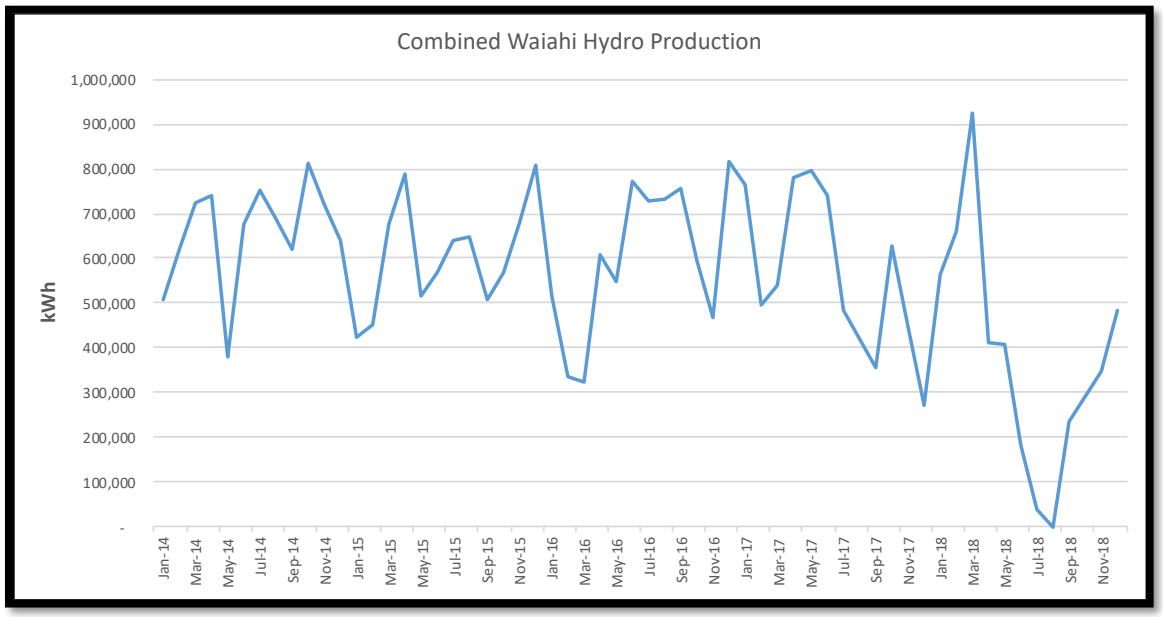
Figure 18. Lower Waiahi Hydropower Plant Generating Unit Performance Curve



Source: Joule Group, LLC

The Upper and Lower Waiahi Hydropower facilities are connected to the grid via a single 12.5 kilovolt (kV) overhead line from the Upper Waiahi Hydropower Plant, through the Lower Waiahi Hydropower Plant, to the Kapaia substation. Their combined output is metered and recorded at the Kapaia substation. As shown in **Figure 19** and **Table 11**, which display a five-year period of record, the output varies considerably and typically ranges 400,000 to 800,000 kilowatt-hour (kWh) per month with an average of 560,450 kWh per month and 6,725,400 kWh annually.

Figure 19. Combined Waiahi Hydropower Plant Production, 2014 to 2018



Source: Joule Group, LLC

Table 11. KIUC Waiahi Hydropower Plant Combined Monthly Production

Facility Name	Period of Record	Minimum Monthly Production	Maximum Monthly Production	Average Monthly Production	Average Annual Production
Combined Waiahi Hydropower Plants	01/01/14 to 12/31/18	0 kWh	925,200 kWh	560,450 kWh	6,725,400 kWh

Source: KIUC

Separate production meter data for the Upper and Lower Waiahi Hydropower Plants is not available with the exception of brief periods when one facility may have been operating while the other was off-line. In an effort to address this, the relationship of hydraulic head, efficiency, and average operational flow as measured at the tailrace gages was compared with the combined production for the same one-year data period. The estimated relative production contribution from the Upper and Lower Waiahi Hydropower Plants in shown in **Table 12**.

Table 12. Relative Production Contribution

Facility Name	Period of Record	Gross Head (feet)	Average Operational Flow (cfs)	Approximate Production Contribution
Upper Waiahi Hydropower Plant	April 2017 to March 2018	254	18.3	40%
Lower Waiahi Hydropower Plant	April 2017 to March 2018	205	37.5	60%

Source: Joule Group, LLC

If the Upper Waiahi Hydropower Plant's historic generation is approximately 40% of the combined 6,725,400 kWh historic average, then the Upper Waiahi Hydropower Plant would have produced approximately 2,690,000 kWh annually and the Lower Waiahi Hydropower Plant would have produced approximately 4,035,000 kWh annually.

Major rehabilitation work on the Upper Waiahi Hydropower Plant was conducted in 2015 and 2016 with the replacement of the penstock and the replacement of the turbine and portions of the powerhouse foundation, respectively. These improvements were replacements of existing 85-year-old equipment with new equipment, thereby extending the life of the plant by another 50 to 75 years. The rehabilitation work also resulted in a significant efficiency improvement and an increase in peak capacity from 500 kW to 700 kW. Downtime associated with the rehabilitation construction and ongoing electrical and flowline repairs have offset the increased operational output of Upper Waiahi Hydropower Plant in the recent years (2016 to 2019). Additionally, the Lower Waiahi Hydropower Plant has experienced anomalous down-time events due to repairs on the aging penstock, which further eroded 2018 production.

As a result of the improvements discussed above, it was forecast that the overall combined average output would increase by approximately 25% from 765 kW average output to a 1,000 kW average annual output (8,760,000 kWh/yr) prior to the impacts associated with reduced diversion flows from the IFS.

1.7.5 IFS Impact to Energy Production

Accurately forecasting the impacts of reduced ditch flow on hydropower production is challenging. As was stated in **Section 1.7.1**, the proposed combined 3.5 mgd (5.4 cfs) and 0.8 mgd (1.3 cfs) IFS volumes can be simplistically subtracted from the 12-month historic average daily flow at Waikoko Stream (USGS 16061200). The result would be that ditch flows would be reduced by up to 28% at the Waikoko Ditch gage. An extension of this approach involves relating this portion of ditch flow to the total expected volume at the Upper Waiahi Hydropower Plant forebay with the addition of the ʻIliʻiliʻula Stream Diversion contribution to determine the reduction to average daily flows that the hydropower plants would have available for generation. Assuming the interim IFS established in 1987 for the ʻIliʻiliʻula Stream Diversion, there would be a 23% reduction in flow available to the Upper Waiahi Hydropower Plant forebay.

Hydropower output is a linear function of head, flow, and equipment efficiency. Both the head and equipment remain unchanged; therefore, hydropower output would be impacted by changes in flow. Assuming that the Upper Waiahi Hydropower Plant's generation contribution is 3,504,000 kWh (40% of the forecast 8,760,000 kWh), then a reduction of 23% would result in a loss of 805,920 kWh per year. The adjusted post-IFS generation of the Upper Waiahi Hydropower Plant would be 2,698,080 kWh per year.

A reduced impact is expected at the Lower Waiahi Hydropower Plant since it receives water from both the Upper Waiahi Hydropower Plant tailrace in addition to water diverted from Waiahi Stream and a

second ʻIliʻiliʻula Stream Diversion. The average operational flow of 25.6 mgd (as shown in **Table 8** in **Section 1.6.6**) would be reduced by 4.3 mgd since that water would be left in the streams instead of routed through the Upper Waiahi Hydropower Plant and subsequently routed to the Lower Waiahi Hydropower Plant. This would result in a post-IFS average operational flow of 21.3 mgd, a reduction of 17%. The Lower Waiahi Hydropower Plant's generation would be reduced from 5,256,000 kWh (60% of the forecast 8,760,000 kWh) to 4,362,480 kWh. **Table 13** compares the pre- and post-interim IFS production.

Table 13. Simplistic IFS Production Impacts

Facility Name	Pre-Interim IFS Forecast Output (kWh/yr)	Post-Interim IFS Forecast Output (kWh/yr)	Production Impact (kWh/yr)	Production Impact (%)
Upper Waiahi Hydropower Plant	3,504,000	2,698,080	805,920	23%
Lower Waiahi Hydropower Plant	5,256,000	4,362,480	893,520	17%
Combined Waiahi Hydropower Plants	8,760,000	7,060,560	1,699,440	19.4%

Source: Joule Group, LLC

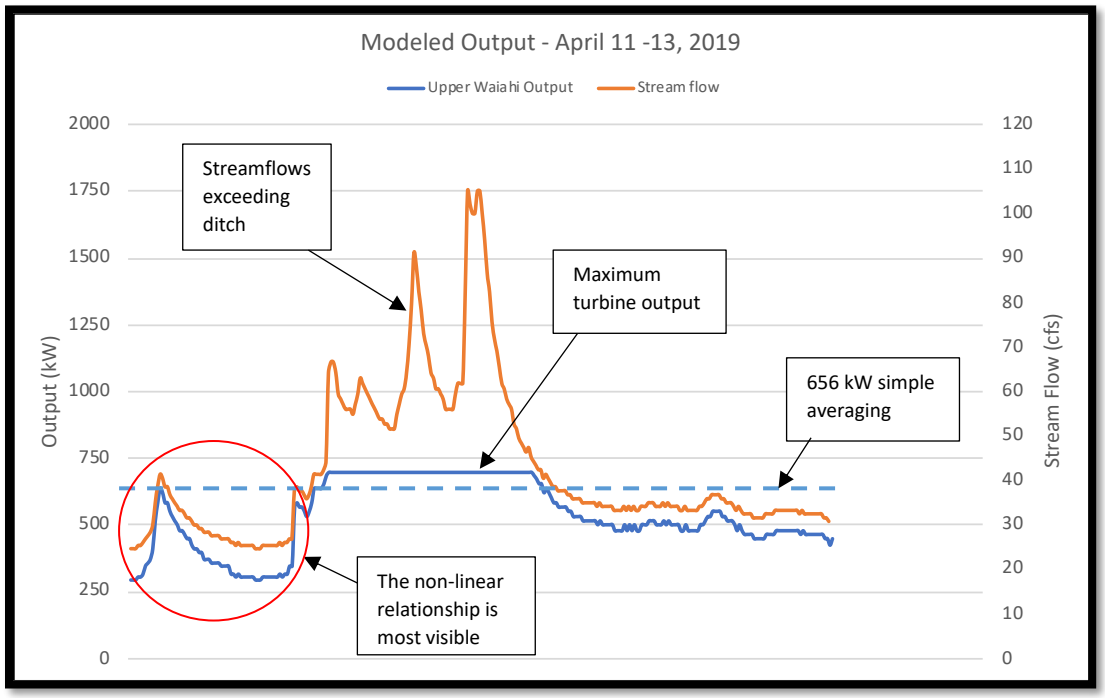
This simplistic analysis of production impacts from implementation of the IFS is conservative but not fully representational. There are several other factors that must be considered:

- **Hydrology:** Data averaging mutes real time dynamics. The daily and annual averages that the simplistic estimates are based upon are not reflective of actual stream flow patterns. Additionally, the IFS reduction to ditch flow is non-linear since it is a fixed value and does not change with variations in stream flow.
- **Ditch Capacity:** The ditch has a hydraulic capacity limit that reduces actual diversion volumes when the real-time stream flow swings to the high side of the daily average.
- **Seepage and Losses:** Initial inspection and spot measurements along the ditch indicate that ditch losses and seepage are non-linear (i.e., the losses are not a consistent percentage but rather a total volume that is relatively consistent if the ditch is delivering 50% capacity or 100% capacity). Losses are not related to flow velocity but rather appear to be related to basic wetting of the channel; therefore, the relative ditch loss percentage increases with a decrease in average flow.
- **Mechanical:** The turbine has a non-linear efficiency curve that drops at lower flows as well as an operating range with a low limit. Reduced flows will result in reduced turbine efficiencies and an increased number of days when there is not enough water to operate.
- **Cumulative IFS Requirements:** ʻIliʻiliʻula and Waiahi Streams contribute a large percentage of the water to the Upper and Lower Waiahi Hydropower Plants, respectively. The IFS values have not been determined for these diversions and any future IFS requirements at the ʻIliʻiliʻula or Waiahi Diversions will further reduce the average ditch flows and, thereby, water available for hydropower generation. In addition, the impacts of the above listed hydrology, ditch dynamics, and mechanical factors will be compounded.

There is not enough data, nor is there post-IFS operational experience, to accurately forecast the additional impacts of the dynamic factors listed above that will cause the real-time production losses to be greater than the simplistic estimates. However, these factors were modeled using known USGS data from the East Branch of the North Fork Wailua River gage (USGS 160680000), which is a similar drainage

area and in the vicinity of the North Fork Wailua River and Waikoko Stream Diversions, to estimate additional production losses. **Figure 20** shows the modeled output comparing stream flow and output from the Upper Waiahi Hydropower Plant for a three-day, one-hour period with precipitation as shown in **Table 14**.

Figure 20. Modeled Output also showing Stream Flow and Output with Simplified Methodology



Source: Joule Group, LLC

Table 14. 15-minute Dataset Flow Records, East Branch North Fork Wailua River

USGS Gage ID	USGS Description	Period of Record	Min Flow (cfs)	Max Flow (cfs)	Mean Flow (cfs)
16068000	EB of NF Wailua River Ditch nr Līhuʻe, Kauaʻi, HI	04/11/19 – 04/13/19	24.7	105	42.4

Source: USGS

As can be seen in the graph above, there is a 50-kW increase of output during a rain event, but it is capped by ditch and turbine capacity. At the beginning of the plot, where there is a more moderate rain event and the flow is down into the middle of the ditch capacity range, the non-linear effects of the turbine efficiency and ditch loss/flow ratio are seen clearly.

Additionally, the turbine got very close to the bottom of its operating curve for a portion of the period. There will be certain conditions where the ditch flow at the turbine intake will drop below turbine operating limit of 7.5 mgd (11.6 cfs) at the Upper Waiahi Hydropower Plant and 14.5 mgd (22.4 cfs) at the Lower Waiahi Hydropower Plant, which would cause the unit to trip offline and drop production to zero. When this happens, generation remains at zero until plant operators from Port Allen go to the plant to restart the unit the day after the stream flows increase. This circumstance could have a noteworthy impact

on production during drier periods, and the future implementation of the IFS at ʻIliʻiliʻula and Waiahi Streams will exacerbate this low operating limit shut down impact significantly.

A cursory analysis of the period of record daily average at USGS 16061200, with the 4.3 mgd (6.7 cfs) combined IFS, a 33% ʻIliʻiliʻula contribution ratio, and a 1.5 cfs seepage loss shows that this low flow turbine operating limit cliff of <11.6 cfs at the Upper Waiahi Hydropower Plant would be reached anytime the available ditch flow at the Waikoko Stream Diversion drops below 15.3 cfs. This equates to 9% of the time for the entire period of record using daily average data with no IFS requirement at ʻIliʻiliʻula Stream. The actual frequency of this low flow cliff scenario and the ability to stabilize the hydropower units at lower than design flows is unknown, but the analysis does demonstrate that the volume level of fixed IFS quantity in relation to the historic variable ditch flow will dramatically increase the frequency of low flow trip events and the corresponding number of zero generation days.

Although there is no current data or post-interim IFS operational experience to accurately forecast real-time production losses, analysis of the modeled output reveals that a production impact of 19.4%, as shown previously in **Table 13**, is a conservative estimate. Therefore, it is KIUC's opinion that an additional 10 to 15% reduction beyond the simplistically calculated 19.4% IFS-related production impact can be expected. This equates to an estimated total impact of 29.5% or a reduction of 2,582,010 kWh resulting in an expected annual generation of 6,177,990 kWh, as shown in **Table 15**.

Table 15. Expected IIFS Production Impact

Facility Name	Pre-Interim IFS Forecast Output (kWh/yr)	Simplistic Post-Interim IFS Forecast Output (kWh/yr)	Real Time & Dynamic Interim IFS Impacts	Forecast Actual Post-Interim IFS Production	Expected Production Impact (%)
Combined Waiahi Hydropower Plants	8,760,000 kWh	7,060,560 kWh	12.5%	**6,177,990 kWh**	**29.5%**

Source: Joule Group LLC

2 PROPOSED ACTION AND ALTERNATIVES

2.1 No-Action Alternative

Under the No-Action Alternative, KIUC would continue to operate its Upper and Lower Waiahi Hydropower Plants under the Revocable Permit. As of the submission of this EA, the Revocable Permit has been renewed by the Board of Land and Natural Resources only through 2019. Continued renewal of the Revocable Permit beyond 2019 is subject to the Board's determination. If the Revocable Permit is not renewed by the Board and a lease is not granted, KIUC would no longer be able to operate and maintain the North Fork Wailua River and Waikoko Stream Diversions and the portion of the ditch system on state land.

While it may be possible for the two hydropower plants to operate with water from the ʻIliʻiliʻula Stream Diversion only, this would result in the loss of as much as three-quarters of the generation from the Upper Waiahi Hydropower Plant and one half of the generation from the Lower Waiahi Hydropower Plant and an approximate doubling of energy cost per kWh. The loss of the use of water from the North Fork Wailua River and Waikoko Stream Diversions would equate to a loss of 5,365 MWh in production of electricity, which would have to be replaced by diesel-burning power plants. It is estimated that 413,500 gallons of diesel would be required to offset the loss of production at the Upper and Lower Waiahi Hydropower Plants resulting from no water from the North Fork Wailua River and Waikoko Stream Diversions. It is unclear at this time whether or not KIUC would continue to operate the two hydropower plants without the use of the North Fork Wailua River and Waikoko Stream Diversions.

It is not known what will happen to the North Fork Wailua River and Waikoko Stream Diversions and ʻIliʻiliʻula North Wailua Ditch if KIUC is not granted a lease. The diversions are existing structures and will continue diverting all water during low to moderate flows unless the state either removes them or modifies them. Permanent diversion modifications to implement the required IFS, to repair existing damage to the structures, and to increase the stability and integrity of the structures would not be completed by KIUC. Maintenance of the diversion structures would be the responsibility of the state.

2.1 Proposed Action

The Proposed Action includes two phases: (1) long-term water lease and (2) modification to the North Fork Wailua River and Waikoko Stream Diversion structures to provide for IFS requirements.

2.1.1 Long-Term Water Lease

As described in **Section 1.1**, KIUC has requested a 65-year, long-term water lease from the BLNR for the diversion of water from the North Fork Wailua River and Waikoko Stream for the Upper and Lower Waiahi Hydropower Plants to replace the existing revocable permit authorizing the diversion of water from the North Fork Wailua River and Waikoko Stream. KIUC is requesting to divert at the North Fork Wailua River Diversion all water available in the stream above and beyond 3.5 mgd at the diversion and at the Waikoko Stream Diversion all the water available in the stream above and beyond 0.8 mgd at the diversion, up to the ditch capacity, which is estimated to be 30 mgd below the Waikoko Stream Diversion. The proposed use of the leased water is to continue to operate the Upper and Lower Waiahi Hydropower Plants. Water from the North Fork Wailua River Diversion in the North Fork Basin would continue to be discharged into

Waikoko Stream upstream of the Waikoko Stream Diversion in the South Fork Basin, as well as at other diversion basins in the South Fork Basin before ultimately being discharged in Waiahi Stream at the Lower Waiahi Powerhouse tailrace.

2.1.2 Modifications to Diversion Structures

Upon receipt of the long-term water lease, KIUC would make permanent modifications to the diversion structures to ensure the CWRM staff recommended interim IFS or any future IFS established by CWRM remains in the stream channel at all times. Permanent modifications would allow for a measured release of water into the stream channel at the diversion. There would also be repairs to the existing diversions at North Fork Wailua River and Waikoko Streams, as well as the incorporation of passageways for aquatic species. The amount of water released into the stream would be monitored by KIUC and CWRM. **Section 1.7** provides details regarding the IFS.

If a lease is granted, KIUC would implement permanent diversion modifications to meet several purposes:

- Reliably implement the required IFS at the point of diversion and provide aquatic species passage
- Repair damage to both structures due to vandalism and general degradation due to the age of the structures and high flow events
- Increase stability and integrity of structures
- Reduce maintenance expense and resource burden, and increase operational reliability

Description of Modifications at the North Fork Diversion

The existing North Fork Wailua River Diversion consists of a concrete diversion weir extending perpendicular to the stream and a concrete ditch channel and overflow section arranged parallel to the stream flow that creates the ditch entrance. Water is diverted by the diversion weir into the ditch inlet, through a gate structure, then into the main ditch channel. The gate structure contains both a head gate to regulate flow into the ditch and a sluice gate to flush sediment or excess flows back into the stream channel. Flow exceeding the ditch capacity spills over the upstream weir section and remains in the stream. During high stream flow events, large bedload movement is displaced into the ditch inlet and channel, which effectively prevents flow from entering the ditch. The existing concrete weir has also sustained damage due to vandalism, which has affected the hydraulic efficiency of the intake and compromised the structure's integrity.

Proposed modifications to the existing diversion would ensure reliable implementation of an IFS and stream connectivity as well as effectively exclude bedload from entering the ditch inlet and channel. The proposed modifications are designed to provide a more hydraulically efficient and reliable operation while significantly lowering the required operation and maintenance effort. By placing the ditch inlet at a higher elevation than the IFS release section, the new design thereby provides a simple passive mechanism that prioritizes stream flow over diversion flow during periods of low to moderate stream flows. A rendering of the completed modifications at the North Fork Wailua River Diversion is shown in **Figure 21**. It is important to note that final design will take into consideration aesthetic values so that visual impact to the area will be minimized to the greatest extent possible.

Figure 21. Rendering of Overhead View of Modified North Fork Wailua River Diversion

Design Features

The proposed diversion is designed to ensure reliable implementation of the IFS and to provide aquatic species passage in the North Fork of the Wailua River by maintaining a minimum flow in the stream. It also heavily reduces stream sediment deposition in the ditch channel, thereby reducing maintenance and increasing operational reliability. The proposed structure is to be constructed immediately upstream of the existing diversion and includes the following new components.

- Concrete headwall
- Intake structure
- IFS/aquatic species passage
- Overflow weir

A new concrete headwall is proposed near the right bank (ditch side) of the stream. The headwall would connect to the upstream side of the existing diversion and extend upstream to tie into the existing rock on the right bank. The wall is designed to guide stream flow over the intake structure effectively passing bed load and debris past the intake, thereby eliminating deposition and blockage of the ditch.

A new drop inlet structure with a slotted intake screen is proposed to collect and divert up to 31 mgd (48 cfs) into the existing ditch inlet. The intake structure is designed with a floor-mounted inclined slotted intake screen sloped from upstream to downstream. The new diversion structure would be constructed immediately upstream from the existing concrete diversion weir and tie into the existing concrete abutment on the left bank. The new headwall would secure the intake structure on the right bank. During normal operation, water would pass through the intake screen into a channel located directly below the

screen, then pass through an intake gate mounted to the right bank headwall into the ditch. The inclined screen design would allow the large boulders and debris mobilized by large flows to continue downstream rather than block the existing ditch channel, which occurs with the existing configuration. A new slide gate would be attached to the new concrete headwall and would allow for manual adjustment of diversion flows into the existing ditch.

The IFS/aquatic species passage V-notch weir and ramp is included in the design to pass up to 6 cfs of flow in the stream. This ramp would be constructed from flat plate steel and is designed to slide into a guide slot in the concrete diversion structure. The use of a fabricated steel insert allows the notch and ramp to be dimensionally altered or adjusted to adjust flow volumes and species accessibility. The sloped ramp would pass the required IFS and allow for aquatic species passage.

An overflow weir is included the design, which would serve to pass stream flows above ditch capacity and/or greater than can be passed in the IFS/aquatic species passage. The overflow weir is to be constructed on the left bank of the stream and anchored to the existing abutment.

Downstream of the new structure, the concrete apron would be repaired and stabilized with grout and rubble masonry to ensure its integrity and prevent scour and backcutting during extreme flow events, as well as to improve aesthetics and public safety at the site.

The proposed North Fork Wailua River Diversion Plan View and Elevation View are shown in **Figure 22** and **Figure 23**, respectively.

Figure 22. Proposed North Fork Wailua River Diversion Plan View

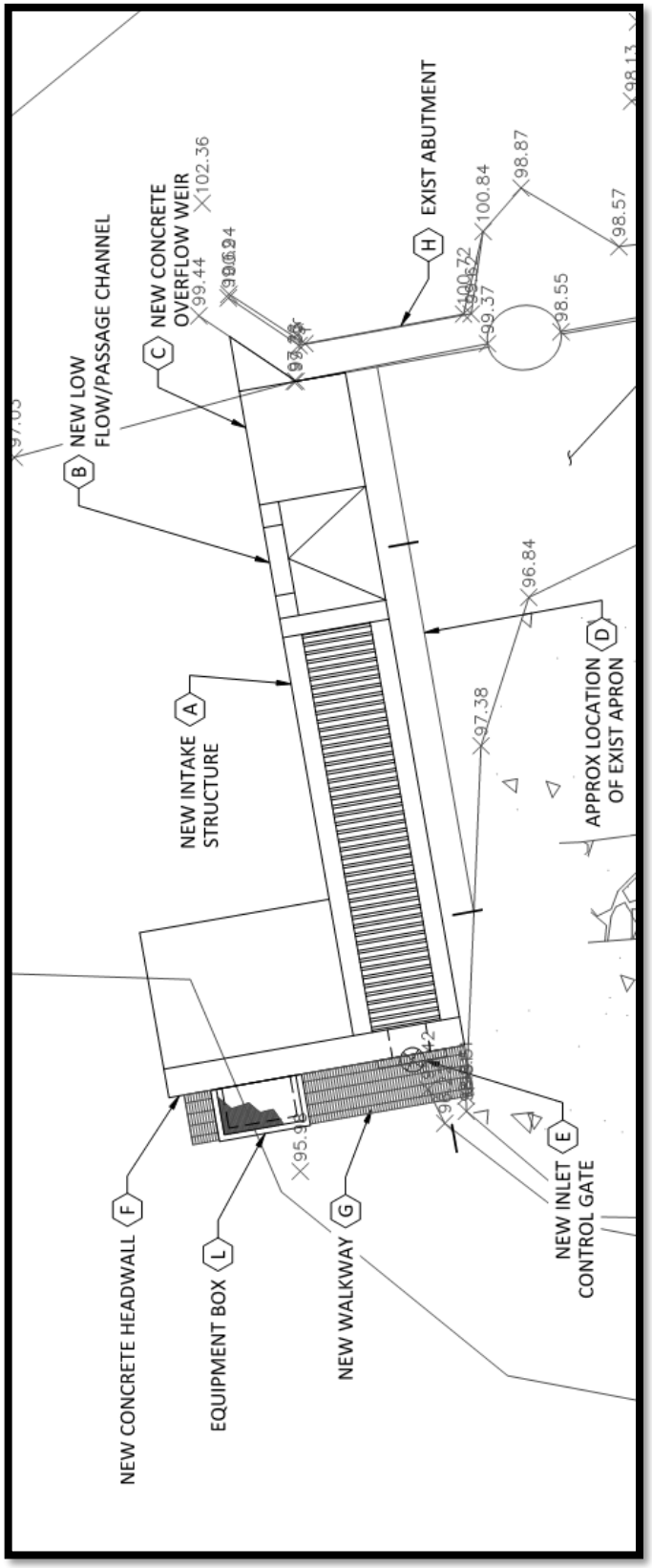
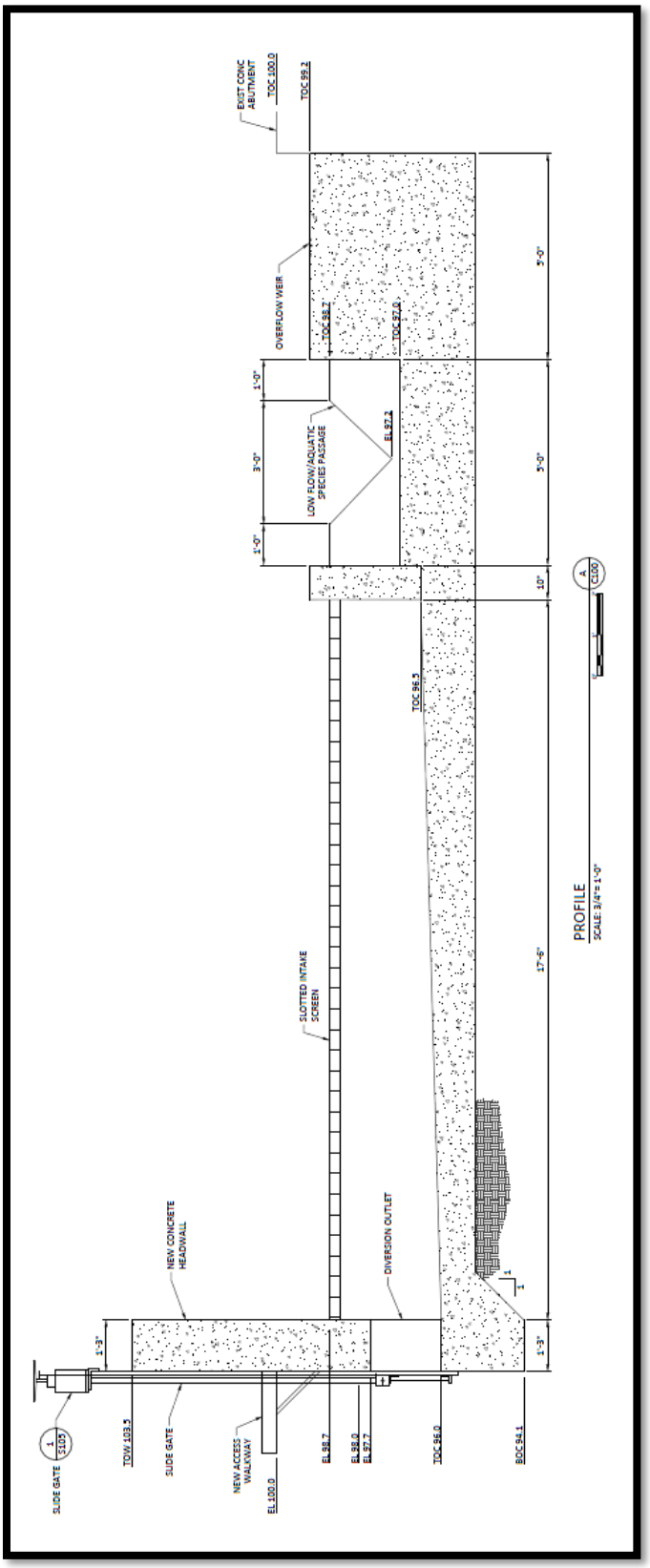


Figure 23. Proposed North Fork Wailua River Diversion Elevation View



Construction Materials and Equipment

Construction would include field excavation, concrete placement, metals and gate installation, and final grading. **Table 16** lists each component of the proposed diversion structure and the associated materials used to construct them. **Table 17** lists the equipment needed for construction.

Table 16. Materials for Construction of the North Fork Wailua River Diversion

Design Component	Construction Material	Quantity
New Concrete Headwall	Reinforced Structural Concrete	7 CY
Slide Gate	Steel or Aluminum	1 EA
Access Walkway	HDG Steel Grating	16 SF
Slotted Intake Screen	Galvanized Steel	61 SF
Diversion Structure	Reinforced Structural Concrete	7 CY
Low Flow Passage Weir/Ramp	Galvanized Steel	1 EA
Overflow Weir	Reinforced Structural Concrete	3 CY
Stream Passage Improvements	Boulder Placement	15 CY
Repair of Existing Concrete	Grout	135 SF
Excavation	Gravel and Cobble Removal	22 CY
Backfill	Gravel and Cobble	12 CY
Clearing and Grubbing	Brush Removal	65 SF

Table 17. Equipment Needed to Construct the North Fork Wailua River Diversion

Equipment Type	Quantity	Purpose
Track Backhoe (Cat 230 size) and Small Excavator	1	• Removal of selective demolition materials • Excavation for diversion structure • Excavation of sediment and debris from the existing intake ditch • Handling of construction materials • Final rock placement and grading • Excavation of spalled concrete sections
Concrete Pump	1	Pump concrete from the concrete truck to the diversion structure concrete forms
Concrete Truck	2	Transport concrete from the concrete plant to the diversion structure construction site
Enclosed Utility Trailer	1	House small tools and equipment onsite
Construction Pickup	2	Transport crew and equipment to the site
Transport Truck and Low Bow Trailer	1	Transport equipment to the project site
Dewatering Pumps	2	Collect and pump flow out of the dewatered area into the ditch during construction

General Construction Approach

Construction of the new diversion structure would require a sequenced process to effectively prepare the site for the diversion intake. A brief description of each the major construction step is presented in the following paragraphs.

- **Mobilization.** To the extent that road access can be utilized, the contractor would mobilize their equipment and construction materials to the project site with a transport truck and a lowboy trailer. Standard four-wheel drive pickup trucks would be used to transport crews and a utility trailer to the project site. It is possible that some construction materials would need to be transported to the site via helicopter. The construction area would be fenced for security and safety purposes.
- **Installation of Erosion and Sediment Control Measures.** The contractor would install appropriate erosion and sediment control measures around the project site to ensure effective protection of the existing riparian corridor and the river during construction.
- **Installation of Cofferdam and Dewatering.** It is anticipated that the right bank side of the diversion structure would be constructed first. Using the track excavator, a textile bulk container bag (i.e., super sacks) cofferdam would be placed on the upstream side of the existing concrete intake weir to dewater the right bank side of the diversion. Once construction of this section is complete, the cofferdam would be repositioned to allow dewatering of the left abutment for construction on the left bank side of the diversion.
- **Selective Demolition.** Areas of spalled concrete and areas of scaled or flaked concrete exposing course gravel aggregate and/or rebar on the existing concrete apron would be removed with a small excavator. Debris within the existing ditch would also be removed.
- **Excavation.** The streambed would be excavated to expose the subgrade elevation. The excavated material would be removed from the main channel, stockpiled, and used for backfill and grading later in the process.
- **Right Abutment Diversion Construction.** Formwork would be constructed on the exposed subgrade, rebar installed, and concrete placed in the concrete forms. The concrete placement would start with the base slab, then the stem walls, and then the headwall structure. The contractor would have the option of providing a precast box section for the main intake channel. The right bank headwall structure would be a cast-in-place structure. With the concrete in place, the contractor would install the canal gate, equipment box, walkway grating, and inclined intake screen on the concrete intake structure.
- **Repositioning the Cofferdam.** After construction of the right abutment diversion structure is complete, the cofferdam super sacks would be repositioned to direct the stream flow into the newly completed intake structure. This would allow dewatering of the left abutment IFS/aquatic species passage and left concrete abutment for construction.
- **Left Abutment Diversion Structure Construction.** The left abutment would be excavated down to subgrade and the new concrete would be placed. The fabricated steel IFS/aquatic species passage would be installed in the guides cast into the concrete.
- **Cofferdam Removal.** The cofferdam would be removed from the stream after all construction is complete.

- **Repairing Existing Downstream Concrete Apron.** The exposed and damaged areas of the existing concrete apron would be repaired with grout and rubble masonry, as appropriate. The damaged areas would be exposed, loose material removed, and high strength non-shrink grout would be installed to repair the holes.
- **Demobilization and Site Restoration.** The contractor's equipment and utility trailer would be removed from the site using existing access roads. Disturbed areas would be reseeded with a native grass mix and protected with a natural erosion protection mat.

Description of Modifications at the Waikoko Stream Diversion

The existing diversion is located at the confluence of the Waikoko Stream and the ʻIliʻiliʻula North Wailua Ditch down-ditch of the North Fork Wailua River Diversion. The diversion routes combined flows from the ʻIliʻiliʻula North Wailua Ditch (diverted at the North Fork Wailua River Diversion) and Waikoko Stream to the ditch channel on the right bank. A low flow/aquatic species passage weir and ramp would be included to maintain the IFS requirement and provide aquatic species passage under a full range of flows. The proposed modifications would result in the ditch inlet being at a higher elevation than the IFS release section, thereby providing a simple passive mechanism that prioritizes stream flow over diversion flow during periods of low to moderate stream flows. Additionally, the modifications would prevent the ʻIliʻiliʻula North Wailua Ditch flows from entering the Waikoko Stream channel. A Rendering of the completed modifications at the Waikoko Stream Diversion is shown in **Figure 24**. It is important to note that final design will take into consideration aesthetic values so that visual impact to the area will be minimized to the greatest extent possible.

Figure 24. Rendering of View from Footpath of Modified Waikoko Stream Diversion

Design Features

The proposed modifications are designed to ensure reliable implementation of the IFS and improve aquatic species passage in Waikoko Stream and prevent commingling of ditch flows with Waikoko Stream flows. The proposed diversion is to be constructed immediately upstream of and attached to the existing diversion and includes the following new components:

- Concrete headwall at the outlet of the ʻIliʻiliʻula North Wailua Ditch tunnel
- Concrete box culvert
- Concrete headwall on the right bank
- Intake structure
- Diversion crest
- IFS/aquatic species passage

A new concrete headwall is proposed at the outlet of the ʻIliʻiliʻula North Wailua Ditch tunnel as it intersects with Waikoko Stream on the left stream bank. The headwall would connect to the existing bedrock on the upstream and downstream sides of the existing diversion and extend upstream to tie into the existing rock on the right bank.

A concrete box culvert would be attached to the headwall to convey flows from the ʻIliʻiliʻula North Wailua Ditch to the existing ditch channel downstream and on the right bank of the Waikoko Stream Diversion. The box culvert would be anchored to the upstream side of the existing diversion. A buried HDPE pipe with appropriate anchoring could be used here in place of a concrete box culvert.

A new concrete headwall is proposed on the right bank at the end of the culvert to keep the Waikoko Stream from flowing directly into the existing ditch and to prevent displacement of stream sediment into the ditch channel during high flow events.

A new drop inlet structure with a slotted intake screen is proposed to collect and divert up to 5 mgd (8 cfs) into the existing ditch inlet. The structure is designed to sit on top of the proposed box culvert. The slotted intake screen would allow cobbles and debris mobilized by large flows to continue downstream rather than collecting in the intake or the ditch inlet. A slide gate attached to the new concrete headwall on the right bank would allow for manual adjustment of diverted flows into the existing ditch.

A new diversion crest is designed to sit between the headwall on the left bank and the IFS flow/aquatic species passage section. This would allow a minimum water surface elevation to be maintained upstream of the diversion.

The IFS/aquatic species passage V-notch weir and ramp is designed to maintain at least 0.8 mgd (1.2 cfs) of flow in the stream channel in all flow conditions. Additionally, a grouted cobble aquatic species ramp is included in the design to assist passage over the existing concrete apron immediately downstream of the existing diversion.

Repair of the existing concrete aprons downstream of the existing diversion would include cleaning out all spalled sections of loose debris and patching with grout.

The proposed Waikoko Stream Diversion Plan View and Elevation View are shown in

Figure 25 and **Figure 26**, respectively.

Figure 25. Proposed Waikoko Stream Diversion Plan View

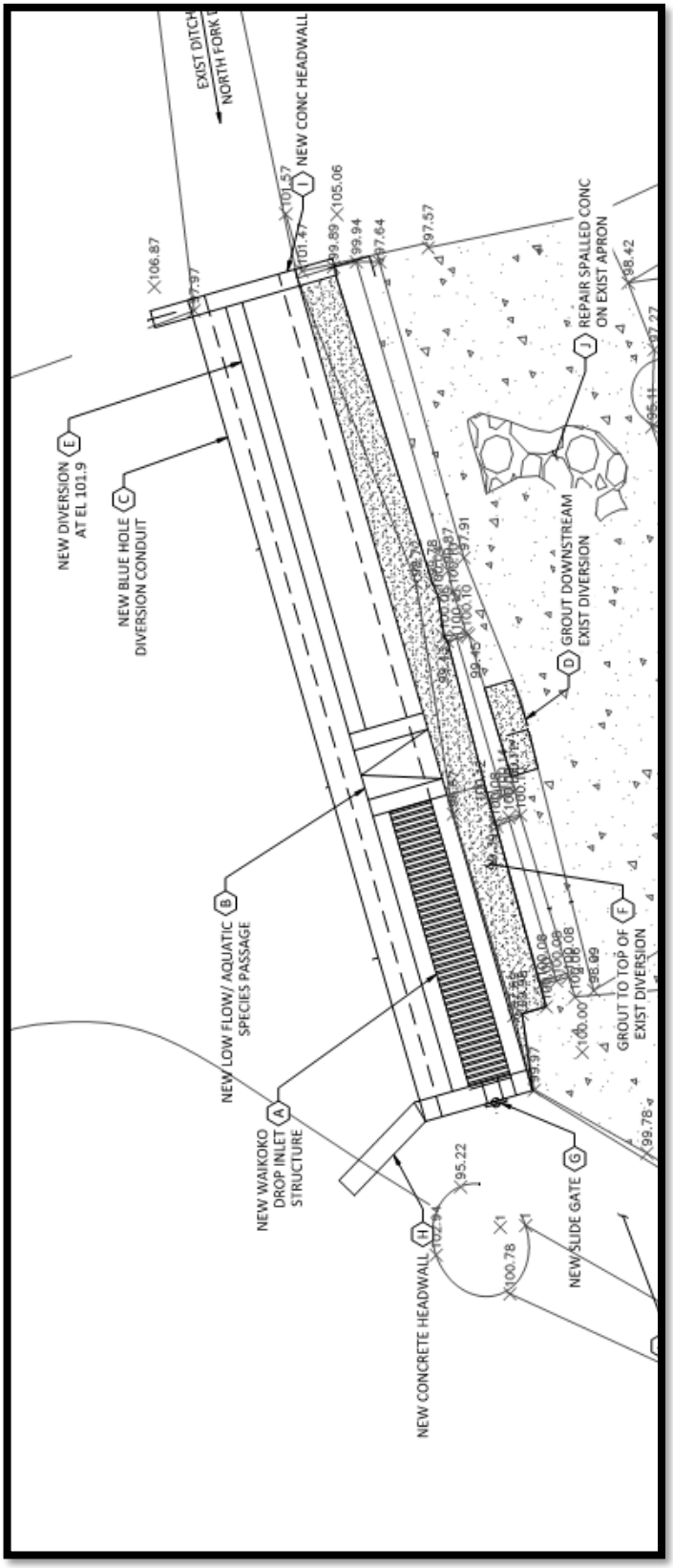
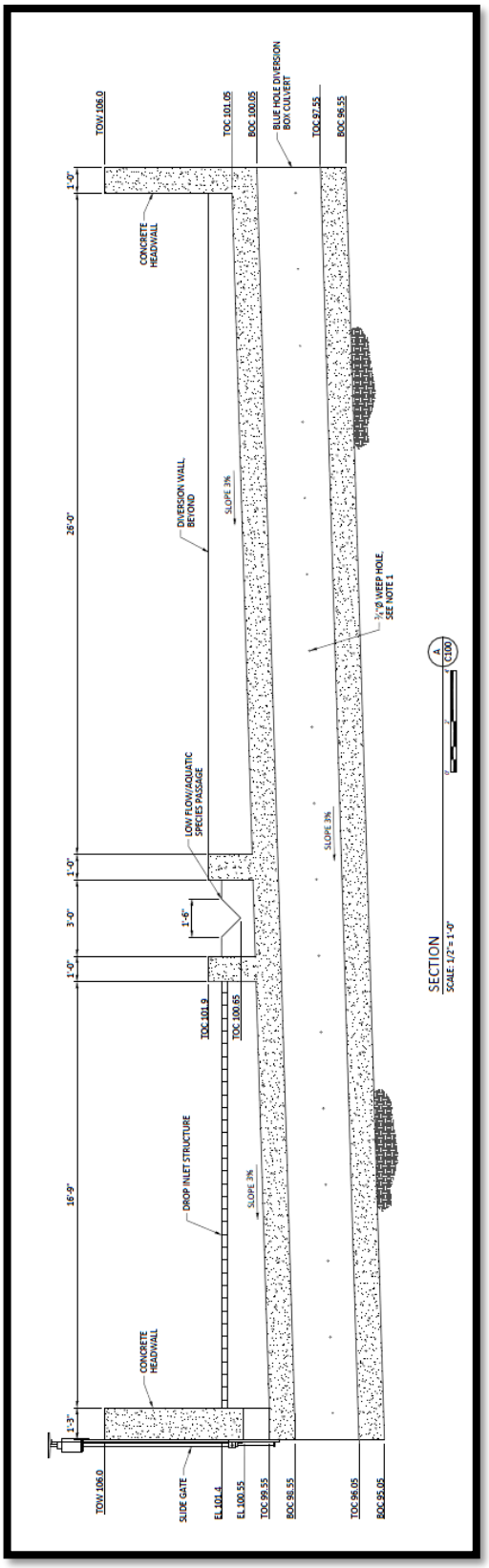


Figure 26. Proposed Waikoko Stream Elevation View



Construction Materials and Equipment

Construction would include field excavation, concrete placement, metals and gate installation, and final grading. **Table 18** lists each component of the proposed diversion structure and the associated materials used to construct them. **Table 19** lists the required equipment.

Table 18. Materials for Construction of the Waikoko Stream Diversion

Design Component	Construction Material	Quantity
New Concrete Headwall (East)	Reinforced Structural Concrete	2 CY
New Concrete Headwall (West)	Reinforced Structural Concrete	6 CY
Slide Gate	Steel or Aluminum	1 EA
Slotted Intake Screen	Galvanized Steel	59 SF
Diversion Structure	Reinforced Structural Concrete	1 CY
Low Flow Passage Weir/Ramp	Galvanized Steel	1 EA
Box Culvert	Reinforced Structural Concrete	34 CY
Stream Passage Improvements	Boulder Placement	10 CY
Repair of Existing Concrete	Grout	400 SF
Fill Between Structures	Grout	7 CY
Excavation	Gravel and Cobble Removal	20 CY
Backfill	Gravel and Cobble	20 CY
Clearing and Grubbing	Brush Removal	100 SF

Table 19. Equipment Required for Construction of the Waikoko Stream Diversion

Equipment Type	Quantity	Purpose
Track Backhoe (Cat 205 size) and Small Excavator	1	• Removal of selective demolition materials • Excavation for diversion structure • Handling of construction materials • Final rock placement and grading • Excavation of spalled concrete sections
Helicopter	1	• Fly construction materials into the project site • Fly concrete into the site for placement in the concrete forms.
Concrete Truck	2	Transport concrete from the concrete plant to the diversion structure construction site
Enclosed Utility Trailer	1	House small tools and equipment onsite
Construction Pickup	2	Transport crew and equipment to the site
Transport Truck and Low Bow Boy Trailer	1	Transport equipment to the project site
Dewatering Pumps	2	Collect and pump flow out of the dewatered area into the ditch during construction

General Construction Approach

Construction of the new diversion structure would require a sequenced process to effectively prepare the site for the diversion intake. A brief description of each of the major construction steps is presented in the following paragraphs.

Concrete/grout batching would take place on-site and all concrete structures will be cast-in-place or flown in by a helicopter with a concrete placement bucket approximately 1.5 CY in size. Once concrete placement is complete the slotted intake screen, slide gate, and IFS/aquatic species passage ramp would be installed. The cofferdam would then be adjusted to route stream flows over the new intake structure into the ditch channel, and the aquatic species grouted cobble ramp, remaining portion of the culvert, new diversion crest, and left bank headwall would be cast-in-place. With everything installed, the cofferdam would be removed and stream flows would be allowed to flow naturally.

- **Mobilization.** The contractor would mobilize their equipment and construction materials to the general area of the project site using a transport truck with a lowboy trailer using existing roads, if possible. If road access is problematic, some construction materials may be transported via helicopter. Four-wheel drive pickup trucks would be used to mobilize crews and a utility trailer to the project site. The construction site would be fenced for security and safety purposes. A track excavator would be walked to the site using an existing jeep road.
- **Installation of Erosion and Sediment Control Measures.** The contractor would install the appropriate erosion and sediment control measures around the project site to ensure effective protection of the existing riparian corridor and the river during construction.
- **Installation of Cofferdam and Dewatering.** Flows into the ʻIliʻiliʻula North Wailua Ditch from the North Fork Wailua River Diversion would be stopped for the duration of the construction window through the use of a cofferdam upstream of the new diversion location. A cofferdam would be constructed of textile bulk container bags, sandbags, or equivalent. It is anticipated that the right bank side of the diversion structure would be constructed first. Using the track excavator, the super sack cofferdam would be placed on the upstream side of the existing concrete intake sill on the right bank side routing water to the left bank side of the stream channel. Once construction of this section is complete, the cofferdam would be repositioned to allow dewatering of the left abutment.
- **Selective Demolition.** Using a small excavator, areas of spalled concrete on the existing overflow spillway would be removed. Large cobble and sediment debris in the existing ditch channel would also be removed.
- **Excavation.** The river floor would be excavated to expose the subgrade elevation. The excavated material would be removed from the main channel.
- **Right Abutment Diversion Construction.** Formwork would be constructed on the exposed subgrade, rebar installed, and concrete placed in the concrete forms. The concrete placement would start with the base slab, then the stem walls, then the headwall structure. The contractor would have the option of providing an HDPE pipe for the North Fork Wailua River Diversion culvert. The right bank headwall structure would be a cast-in-place structure. With the concrete in place, the contractor would install the canal gate, equipment box, walkway grating, and inclined intake screen on the concrete intake structure.

- **Repositioning the Cofferdam.** With the construction of the right abutment diversion modifications complete, the cofferdam super sacks would be repositioned to direct the stream flow into the newly completed intake structure. This would allow dewatering of the left abutment IFS and aquatic species channel and left concrete abutment for construction.
- **Left Abutment Diversion Structure Construction.** The left abutment would be excavated down to subgrade and the new concrete would be placed. The fabricated steel IFS and aquatic species ramp would be installed in the guides.
- **Cofferdam Removal.** The cofferdam would be removed from the stream.
- **Repair of the Existing Overflow Spillway.** The exposed and damaged areas of the existing overflow spillway would be repaired with grout. The damaged areas would be exposed, loose material removed, and high strength non-shrink grout installed to repair the holes.
- **Demobilization and Site Restoration.** The contractor's equipment and utility trailer would be removed from the site using existing access roads. Disturbed areas would be reseeded with a native grass mix and protected with a natural erosion protection mat.

2.2 Purpose and Need for the Proposed Action

2.2.1 Purpose of the Proposed Action

The purpose of the Proposed Action is to continue to operate the two hydropower plants on Waiahi Stream: the Upper Waiahi Hydropower Plant and the Lower Waiahi Hydropower Plant. Renewable energy generated by hydropower plants reduces imports of oil for conventional diesel electric power generation along with resultant greenhouse gas emissions. The continued operation of KIUC's Upper and Lower Waiahi Hydropower Plants would assist KIUC in meeting the State of Hawaiʻi mandate to achieve 100% renewable energy by 2045.

2.2.2 Need for the Proposed Action

KIUC is currently diverting and using water from the North Fork Wailua River and Waikoko Stream Diversions to power its Upper and Lower Waiahi Hydropower Plants under an existing revocable permit, RP No. S-7340, which must be renewed each year. The long-term water lease is needed to ensure continued operation of the Upper and Lower Waiahi Hydropower Plants for the next 65 years.

The Upper and Lower Waiahi Hydropower Plants provide many benefits, including the following:

- Provide reliable power to KIUC's 33,000 members.
- Contribute 1.5 MW of power to the system and provide an extremely cost-effective and reliable source of energy.
- Provide a foundational element of KIUC's renewable portfolio that is currently at approximately 55% renewable with a KIUC goal of reaching 70% renewable generation by 2030 and a State of Hawaiʻi mandate of reaching 100% renewable energy by 2045.
- Upon completion of modifications for compliance with IFS requirements, would be regulated for environmental compliance.
- Provide significant greenhouse gas reduction. The Upper and Lower Waiahi Hydropower Plants are capable of producing approximately 8,760 MWh of energy for the island's grid, which saves approximately 675,000 gallons of oil being imported to the island every year.

- The associated ditches support downstream farmers, which allows agriculture to continue to flourish in the Kālepa-Wailua region. The ditch system was built nearly 100 years ago to support Kauaʻi's sugar industry. Today, the Upper and Lower Waiahi Hydropower Plants and associated ditches continue to support diversified agriculture in Central Kauaʻi.

2.3 Project Schedule

It is expected that the HRS 343 process would be complete by December 2019 and that the long-term water lease would be issued by the BLNR upon completion of the HRS 343 process. Long-term modifications to the diversion structures would occur immediately upon approval of the long-term water lease and receipt of required permits for the work.

2.4 Permits and Approvals Which May Be Required for the Proposed Action

In addition to the environmental disclosure requirements of HRS Chapter 343, implementation of the Proposed Action would require coordination with state and county agencies for permits or approvals. The permits and approvals presented in **Table 20** may be required for the Proposed Action. Permit requirements would be determined through continued agency coordination during the HRS Chapter 343 process.

Table 20. Permits and Approvals Which May Be Required for the Proposed Action

Permit or Approval	Description	Regulation(s)	Administrative Authority
Long-Term Water Lease			
Long-Term Lease of Water Rights	Long-term (65-year) lease to continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions to continue to operate the Upper and Lower Waiahi Hydropower Plants located along Waiahi Stream in the South Fork Basin of the Wailua River. Application submitted in 2004.	• HRS Section 171-58 • Act 216 (amendment to HRS Section 171-58)	BLNR
Modifications to the Diversion Structures			
National Pollutant Discharge Elimination System (NPDES) Permit	NPDES Individual Permit required for stormwater discharge associated with construction activities.	• Clean Water Act, Section 401 • HAR Section 11-55	Department of Health (DOH)-Clean Water Branch (CWB)
NPDES, Dewatering Permit	NPDES Individual Permit required for discharges associated with construction activity dewatering.	• HAR Section 11-55	DOH-CWB
Community Noise Permit/Community Noise Variance	Required for construction projects exceeding 78 decibels (dBA) or has a total cost of more than $250,000.	• HRS Chapter 342F • HAR Title 11, Chapter 46	DOH-Indoor and Radiological Health Branch

Permit or Approval	Description	Regulation(s)	Administrative Authority
Conservation District Use Permit	Required for projects located within the Conservation District	• HRS Chapter 183C • HAR Title 13, Chapter 5	DLNR, Office of Conservation and Coastal Lands
Historic Preservation Review	Required for projects that may affect historic property or a burial site. Required for projects that require a federal permit.	• HRS Chapter 6E • Section 106, National Historic Preservation Act	DLNR, State Historic Preservation Division (SHPD)
Stream Diversion Works Permit	Required for any project that constructs or alters stream diversions to ensure that the work is consistent with the general plan and land use policies of the State and affected county.	• HRS Chapter 174C • HAR Chapter 13-168	DLNR, Commission on Water Resource Management (CWRM)
Stream Channel Alteration Permit	Required for any project that would alter a stream channel.	• HRS Chapter 174C • HAR Chapter 13-169	CWRM
Section 404 Individual Permit	Required for any project that would discharge dredged or fill material into waters of the United States.	• Clean Water Act, Section 404	U.S. Army Corps of Engineers
Section 401 Water Quality Certification	Required for all projects that require a federal permit or may result in discharge into State waters.	• Clean Water Act, Section 401 • HAR Chapter 11-54	DOH-CWB
Endangered Species Review	Required for projects that require a federal permit.	• Section 7, Endangered Species Act	U.S. Fish and Wildlife Service

2.5 Anticipated Findings and Determination

Based on the significance criteria set forth in HAR 11-200 and discussed in **Section 5.1**, it is anticipated that the Proposed Action would not have a significant adverse impact on the environment. The Proposed Action is anticipated to have a positive effect on the environment since the modifications to the diversion structures would implement the IFS, which would increase the amount of water left in the streams. Therefore, it is anticipated that a Finding of No Significant Impact (FONSI) would be filed with the State of Hawaiʻi Office of Environmental Quality Control following the public comment period.

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3 ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MINIMIZATION AND MITIGATION MEASURES

3.1 Air Quality and Climate

The Clean Air Act of 1972 and its 1990 Amendments (CAA) and subsequent legislation regulate air emissions from area, stationary, and mobile sources. Both the U.S. Environmental Protection Agency (USEPA) and the State of Hawaiʻi have instituted Ambient Air Quality Standards (AAQS) to maintain air quality in the interest of public health and secondary public welfare.

At the present time, seven parameters are regulated: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. The Hawaiʻi AAQS are in some cases considerably more stringent than the comparable National Ambient Air Quality Standards (NAAQS). In particular, the Hawaiʻi 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit. **Table 21** illustrates the NAAQS and State AAQS and the units of measure (micrograms per cubic meter [$\mu g/m^3$] and parts per million [ppm]).

In addition to the NAAQS and the State AAQS, the State of Hawaiʻi Department of Health DOH regulates fugitive dust. HAR Section 11-60.1-33, Fugitive Dust, states that no person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions, and no person shall cause or permit the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates (DOH, 2014). This rule applies to construction projects and would, therefore, be applicable to the Proposed Action.

3.1.1 Existing Conditions

Air Quality

Prevailing winds throughout the year in Hawaiʻi are the northeasterly trade winds. These trade winds keep the air quality generally good. The DOH operates a network of air quality monitoring stations at various locations around the state, including one in the Niumalu residential subdivision approximately one mile downwind of the Cruise Ship Pier in Nāwiliwili Harbor. The sole purpose of this air quality monitoring station that was established in April 2011 is to monitor for emissions from cruise ships. It monitors SO_2, NO_2, and $PM_{2.5}$. In 2015, the highest concentration of SO_2 was 0.048 ppm, and the 98th percentile was 0.014 ppm. There were no occurrences of one-hour averages greater than 0.075 ppm (the federal standard). In 2015, the highest concentration of NO_2 was 0.038 ppm, and the 98th percentile was 0.032 ppm. There were no occurrences of one-hour averages greater than 0.100 ppm (the federal standard). In 2015, the highest concentration of $PM_{2.5}$ was 13.2 $\mu g/m^3$, and the 98th percentile was 10.1 $\mu g/m^3$. The annual average was 3.3 $\mu g/m^3$, and there were no occurrences of 24-hour concentrations greater than 35 $\mu g/m^3$ (the federal and state standard).

Table 21. State of Hawaiʻi and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaiʻi
Particulate Matter <10 microns (PM_{10})	µg/m³	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter <2.5 microns ($PM_{2.5}$)	µg/m³	Annual 24 Hours	12[c] 35[d]	15[c] 35[d]	- -
Sulfur Dioxide (SO_2)	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide (NO_2)	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide (CO)	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone (O_3)	ppm	8 Hours	0.070[g]	0.070[g]	0.08[g]
Lead	µg/m³	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppb	1 Hour	-	-	25[b]

Notes: [a]Not to be exceeded more than once per year on average over three years.
[b]Not to be exceeded more than once per year.
[c]Three-year average of the weighted annual arithmetic mean.
[d]98th percentile value averaged over three years.
[e]Three-year average of fourth-highest daily 1-hour maximum.
[f]98th percentile value of the daily 1-hour maximum averaged over three years.
[g]Three-year average of annual fourth-highest daily 8-hour maximum.
[h]Rolling 3-month average.
[i]Quarterly average.
Source: DOH, 2015

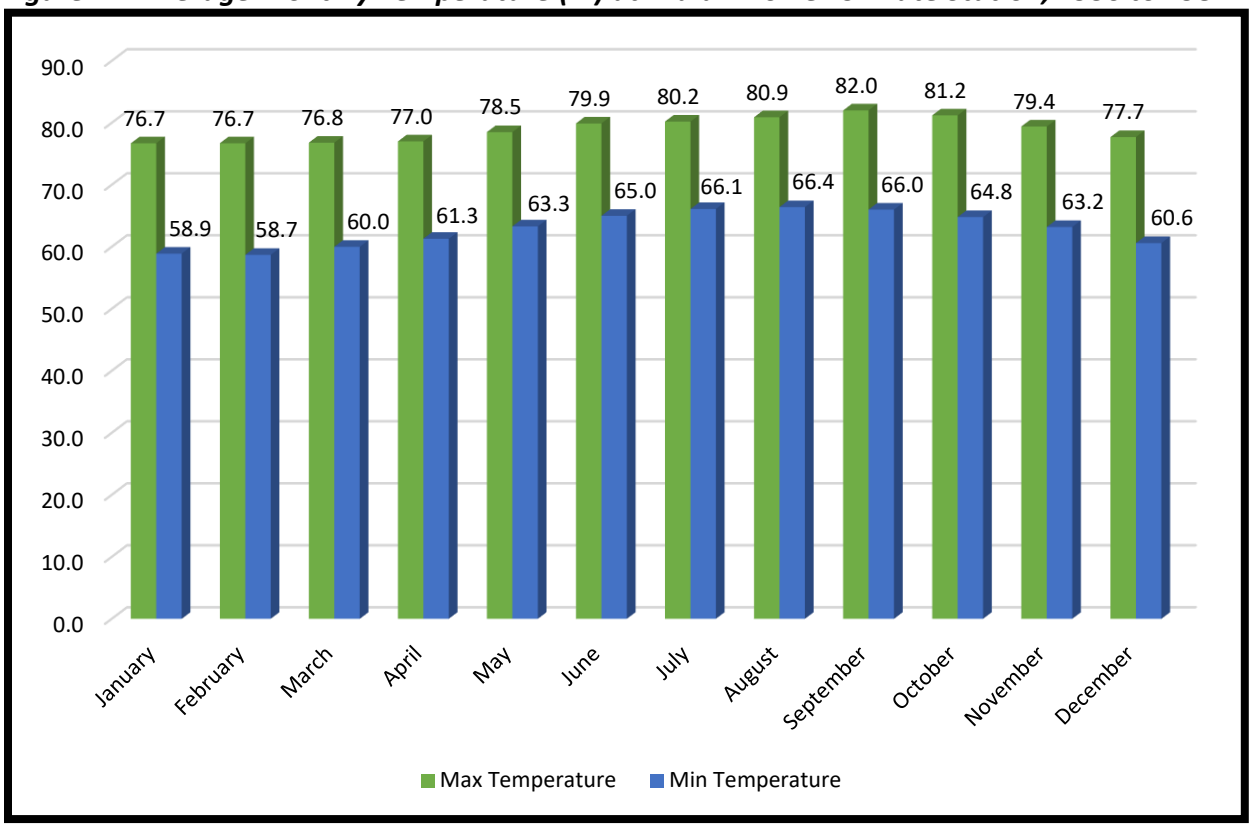
Climate

The Proposed Action is located on the east side of the island of Kauaʻi mauka of Wailua, Līhuʻe, and Wailua River State Park. This area features a tropical rainforest climate with substantial rainfall throughout the year. Temperature and rainfall varies with altitude with cooler temperatures and more rain at higher elevations. Temperatures in this area are moderate and equable throughout the year. This reflects the small seasonal variation in the energy received from the sun and the tempering effect of the surrounding Pacific Ocean. Being situated in the tropics, the state of Hawaiʻi has a relatively uniform day length and temperature throughout the year.

Temperature data for the project area was obtained at the Waiahi Lower Climate Station from 1936 to 1987. This data shows that the average maximum temperature at the location is 78.9 degrees Fahrenheit (°F) and the average minimum temperature is 62.9°F. As shown in **Figure 27**, the warmest months are September and October with average temperatures of 82.0°F and 81.2°F, respectively. The coolest

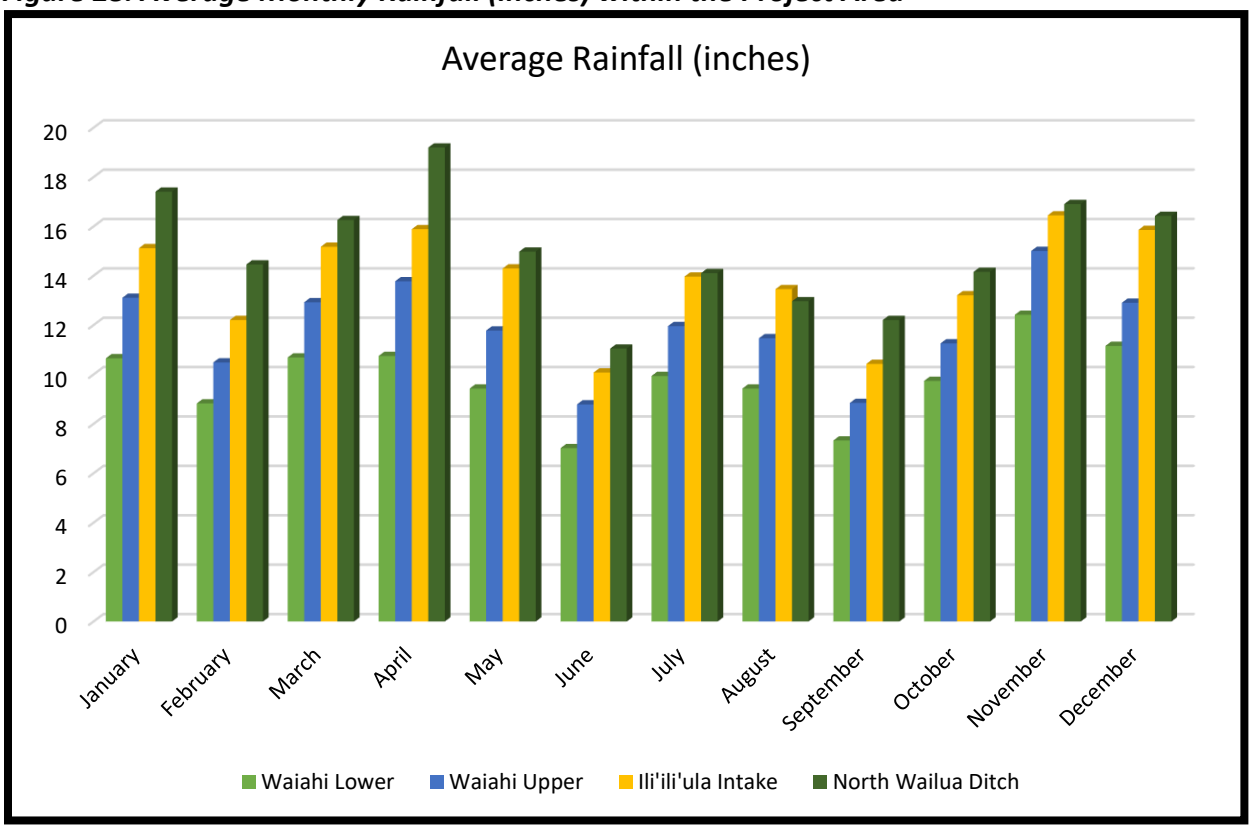
months are January and February with average temperatures of 58.9°F and 58.7°F, respectively (WRCC, 1987a).

Figure 27. Average Monthly Temperature (°F) at Waiahi Lower Climate Station, 1936 to 1987



Rainfall data for the project area was obtained at four climate stations: Waiahi Lower (1936 to 1987), Waiahi Upper (1943 to 1987), ʻIliʻiliʻula Intake (1949 to 1987), and North Wailua Ditch (1949 to 2000). As shown in **Figure 28**, the average monthly and yearly rainfall increases with elevation. Rainfall amounts range from an average annual total of 117.40 inches at the Waiahi Lower Climate Station to 180.15 inches at the North Wailua Ditch Climate Station. The wettest months are generally November, December, and January (WRCC, 1987a, 1987b, 1987c, 2000).

Figure 28. Average Monthly Rainfall (inches) within the Project Area



3.1.2 Potential Impacts

Construction

The long-term water lease would not require any construction activities; therefore, there would not be any short-term impacts to the existing air quality.

Only short-term construction-related impacts to air quality are anticipated with implementation of the Proposed Action. During construction, potential emission sources that may affect air quality at the diversion structures include the following:

- Diesel and/or gasoline-powered construction equipment and motor vehicles would contribute to additional CO and CO_2 in the air.

Because levels of criteria pollutants in Hawaiʻi are consistently below Federal and State AAQS, and because the prevailing trade winds rapidly carry pollutants offshore limiting the effect on receptors, increases in levels of criteria pollutants at the project sites from construction activities are not expected to be significant. It is not anticipated that Federal or State AAQS would be exceeded during construction activities.

Under the No-Action Alternative, no construction activities would occur; therefore, there would be no construction-related impacts.

Operation

The long-term water lease would ensure continued operation of the Upper and Lower Waiahi Hydropower Plants for the next 65 years. Hydropower can have a beneficial effect on air quality by reducing fossil-fueled energy generation and the associated air emissions.

Hydroelectric power production does not create noxious emissions. The estimated future production of the Upper and Lower Waiahi Hydropower Plants prior to consideration of the CWRM staff recommended interim IFS is 8,760 MWh annual combined output, which equates to approximately 675,000 gallons of diesel per year displaced by renewable energy. With the proposed IFS values of 3.5 mgd at the North Fork Wailua River Diversion and 0.8 mgd at the Waikoko Stream Diversion, this annual combined production would be reduced by an estimated 29.5% to a post-IFS annual generation of approximately 6,177,990 kWh. By displacing fossil fuel power generation, the Upper and Lower Waiahi Hydropower Plants have a beneficial impact on air quality in Hawaiʻi. Those beneficial impacts are increased when production of the hydropower plants is increased.

Under the No-Action Alternative, if the hydropower plants continue to operate, the Upper Waiahi Hydropower Plant would be limited to obtaining water only from the ʻIliʻiliʻula Stream Diversion and the Lower Waiahi Hydropower Plant would be limited to obtaining water from the ʻIliʻiliʻula Stream and Waiahi Stream Diversions, which would result in the loss of as much as three-quarters of the generation from the Upper Waiahi Hydropower Plant and one-half of the generation from the Lower Waiahi Hydropower Plant. The loss of the use of water from the North Fork Wailua River and Waikoko Stream Diversions would equate to a loss of 5,365 MWh in production of electricity, which would have to be replaced by diesel-burning power plants. It is estimated that 413,500 gallons of diesel would be required to offset this loss of production from the Upper and Lower Waiahi Hydropower Plants. The current beneficial impacts to air quality from operation of the two plants would be reduced.

3.1.3 Minimization and Mitigation Measures

A dust control plan would be developed and implemented to minimize fugitive dust during construction, to be approved by the DOH. The plan would include some or all of the following measures:

- Watering of active work areas and project access roads, as needed
- Screening piles of materials from wind, if appropriate
- Covering open trucks carrying construction materials
- Limiting areas to be disturbed at any given time
- Mulching or chemically stabilizing inactive areas that have been disturbed

Additionally, contractors would be required to maintain equipment with emissions controls.

3.2 Noise

Noise is defined as unwanted sound and is one of the most common environmental issues of concern to the public. A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (i.e., noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels (HAR, Section 12-200.1 – Occupational Noise Exposure).

The State of Hawaiʻi Community Noise Control Rule (HAR Chapter 11-46) defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, and generators. The accepted unit of measure for noise levels is the decibel (dB). The Community Noise Control Rule does not address most moving sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rule does regulate noise related to construction activities, which may not be stationary.

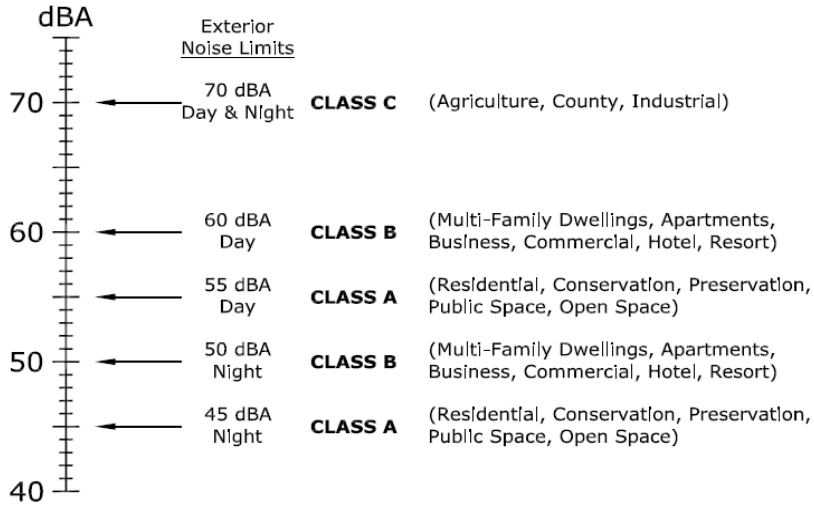
The State of Hawaiʻi regulates noise exposure in the following statutes and rules:

- HRS, Section 342F – Noise Pollution
- HAR, Section 11-46 – Community Noise Control

The maximum permissible noise levels are enforced by the DOH for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in **Figure 29**. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

Figure 29. Hawaiʻi Maximum Permissible Sound Levels for Various Zoning Districts

Zoning District	**Day Hours** (7 AM to 10 PM)	**Night Hours** (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)



As discussed in **Section 4.1.2**, the project area is zoned Conservation. This puts the project area in a Class A Zoning District with a maximum permissible sound level during daytime hours (7 AM to 10 PM) of 55 dBA and a maximum permissible sound level of 45 dBA during nighttime hours (10 PM to 7 AM). Therefore, a Community Noise Permit would be required from the Indoor and Radiological Health Branch of the DOH.

3.2.1 Existing Noise Environment

The project area is within a forested area with no adjacent noise producers, which creates a very quiet noise environment. However, tourist helicopters are prevalent and frequent around and above the Blue Hole area, and the diversions are along one of the normal helicopter routes. Noise from helicopters is frequent (often every half hour during midday) and loud to the point of difficulty in hearing conversations on the ground. Noise from the current operations is limited to inside the powerhouses.

3.2.2 Potential Impacts

Construction

Noise generated during construction of the Proposed Action would be short-term and limited to the areas of construction at the diversion structures. Noise would be generated by construction equipment employed to implement the Proposed Action. Construction equipment would include excavators, trucks, and other heavy equipment. Earthmoving equipment (e.g., an excavator) would probably be the loudest piece of equipment used during construction. Typical noise emission levels for construction equipment are provided in **Table 22**.

Table 22. Typical Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Backhoe	80
Bulldozer	82
Chain Saw	85
Concrete/Grout Pumps	82
Crawler Service Crane (100-ton)	83
Dump Truck	88
Excavator	85
Front End Loader	80
Generator	81
Jackhammer (compressed air)	85
Lift Booms	85
Pick-Up Truck	55
Power-Actuated Hammer	88
Water Pump	76
Water Truck	55

Source: FHWA, 2015.

The North Fork Wailua River and Waikoko Stream Diversions are located in the Līhuʻe-Kōloa Forest Reserve, which is a highly utilized area for recreation. Noise from construction may reduce the enjoyment for recreationists (e.g., hikers) in the vicinity of construction. However, this would be short-term and temporary, and there are ample recreation opportunities throughout the area that would not be impacted by construction noise at the North Fork Wailua River and Waikoko Stream Diversions. Therefore, noise impacts associated with construction of the Proposed Action would be less than significant.

Under the No-Action Alternative, no construction activities would occur and there would be no noise related impacts.

Operation

The long-term water lease would allow continued diversion of water from the North Fork Wailua River and Waikoko Stream Diversions. Since the long-term water lease would allow continued operation of the existing diversion facilities, the noise environment would remain the same as at present. Therefore, there would be no noise impacts associated with the diversion of water under the long-term water lease. Continued operation of the Upper and Lower Waiahi Hydropower Plants would not have noise impacts. As stated previously, noise from current operations is limited to inside the powerhouses. Therefore, operation of the Proposed Action would not have noise impacts.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or continue operation at a reduced capacity. Noise from reduced operations would be limited to inside the powerhouses. Therefore, operation of the No-Action Alternative would not have noise impacts.

3.2.3 Minimization and Mitigation Measures

Noise generated from short-term construction activities and the use of machinery would be minimized by requiring contractors to adhere to state and county noise regulations. To reduce noise exposure, construction activities would be conducted on weekdays and in daytime hours. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring, as well as development of administrative and engineering controls, would be employed.

No minimization or mitigation measures are proposed for noise created during plant operations since it would be confined to the powerhouse.

3.3 Geology and Soils

3.3.1 Existing Conditions

Geology

The island of Kauaʻi is the oldest of the eight main Hawaiian Islands and consists of a single shield volcano. Topographically, Kauaʻi is a product of heavy erosion with broad, deep valleys and large alluvial plains. The highest point on the island is Kawaikini at 5,208 feet above mean sea level (msl), which together with Waiʻaleʻale forms the central hub of the island.

The project facilities are located between approximately 1,100 feet above msl (North Fork Wailua River Diversion) and 550 feet above msl (Lower Waiahi Hydropower Plant). The topography of the area is shown in **Figure 30**.

Soils

Soils in the project area vary depending on the location, as described below and shown in **Figure 31**.

- **North Fork Wailua River Diversion:** Soils are part of the Hulua Series. These soils consist of poorly drained soils on uplands and have a layer of indurated ironstone at depths of 10 to 20 inches. They developed in material weathered from basic igneous rock and are gently sloping to very steep. Elevations range from 400 to 2,400 feet. The specific soil type is **Hulua gravelly silty clay loam, 25 to 70 percent slopes (HNUF)**. Permeability is moderately rapid, except in the ironstone layer, which is nearly impermeable. Runoff is very rapid, and the erosion hazard is severe to very severe.
- **Waikoko Stream Diversion:** Soils are considered Riverwash (rRH), and they consist of nearly level bars of sand, gravel, and stones along perennial and intermittent streams. In places, it consists mainly of large stones and boulders. It is nearly bare of vegetation and is subject to overflow and shifting during normally high water.
- **ʻIliʻiliʻula Stream Diversion:** Soils are considered Rough Broken Land (rRR), which consist of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountainsides with a slope of 40 to 70 percent. Elevations range from nearly sea level to approximately 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. Dominant vegetation in wetter areas includes ʻŌhiʻa, kukui, kia, and ferns. Puakeawe, aalii, and sweet vernalgrass are common at higher elevations.
- **Upper Waiahi Powerhouse:** Soils are part of the Hanalei Series. These soils consist of somewhat poorly drained to poorly drained soils on bottom lands. These soils develop in alluvium derived from basic igneous rock. They are level to gently sloping. Natural vegetation consists of paragrass, sensitiveplant, honohono, Java plum, and guava. The specific soil type is **Hanalei silty clay, deep water table, 0 to 6 percent slopes (HrB)**, which is located on stream bottoms and flood plains. Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight. The water table is at a depth of more than three feet.
- **Lower Waiahi Powerhouse:** Soils are part of the Hanamāʻulu Series, which consist of well-drained soils on stream terraces and steep terrace breaks. These soils are developed in alluvium washed from upland soils. They are nearly level to strongly sloping. Elevations range from 200 to 700 feet. Natural vegetation consists of guava, pandanus, glenwoodgrass, ricegrass, hau, and mango. The specific soil type at the site is **Hanamāʻulu silty clay, 3 to 8 percent slopes (HsB)**, and is located on terraces. Permeability is moderately rapid. Runoff is slow, and the erosion hazard is no more than slight.

Figure 30. Topography

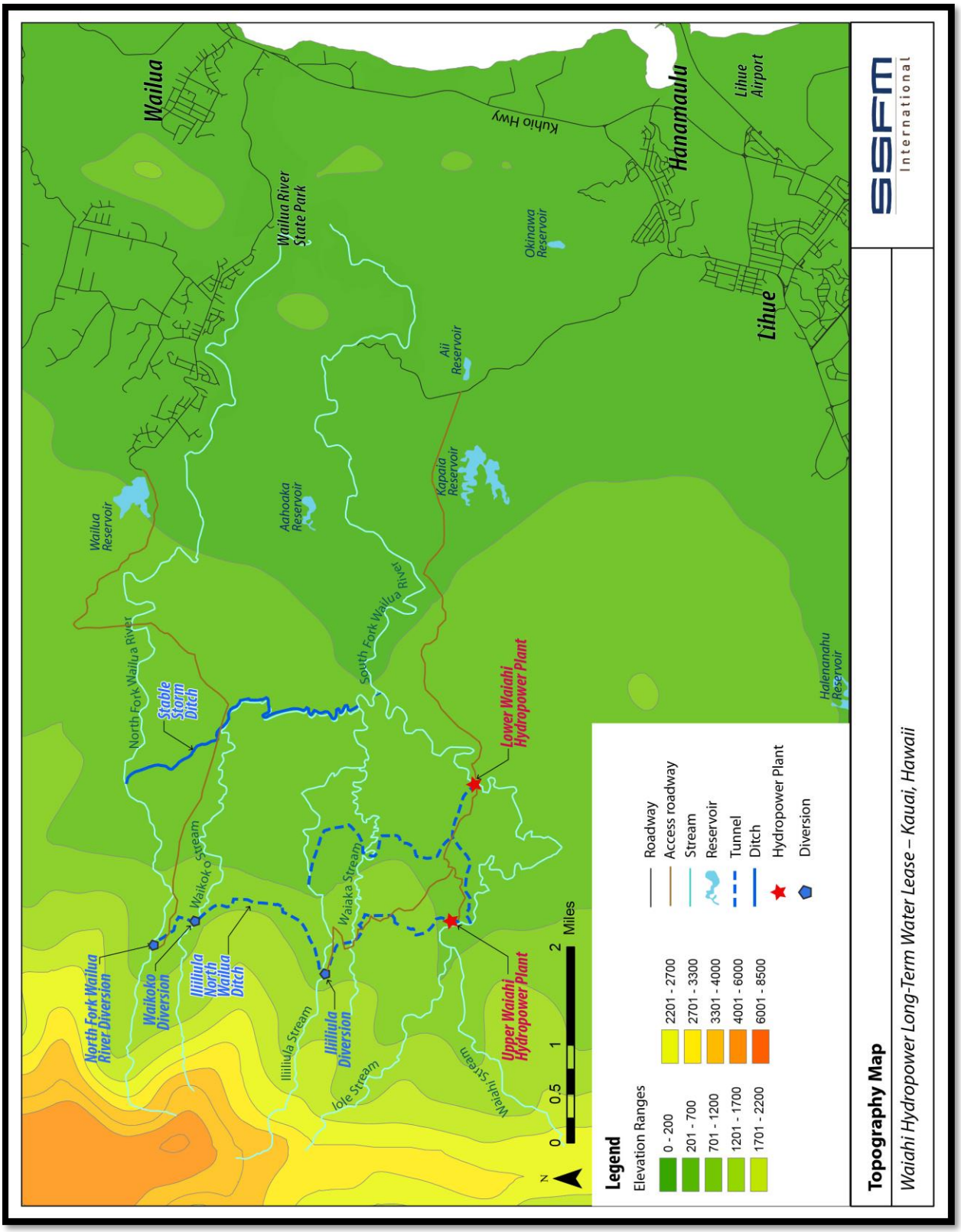
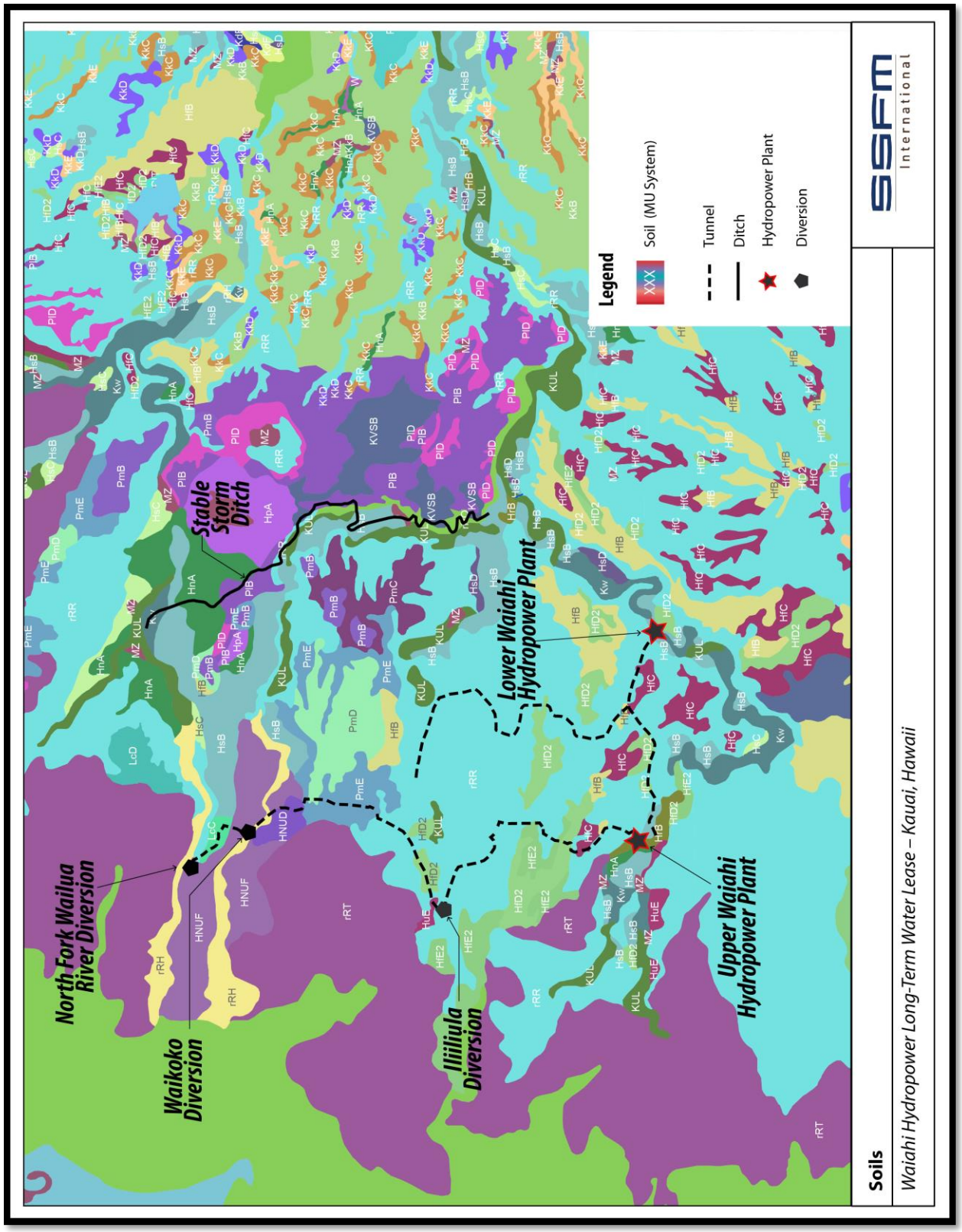


Figure 31. Soils within the Project Area



3.3.2 Potential Impacts

Construction

Geologic conditions at the project sites impose no overriding constraints on the Proposed Action. Effects on geology and soils from construction of the Proposed Action would be limited to the potential for disturbed soils in the construction areas at the North Fork Wailua River and Waikoko Stream Diversions to be eroded as a result of being carried away by storm water runoff or wind.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to geology or soil resources.

Operation

Under the Proposed Action, the Upper and Lower Waiahi Hydropower Plants would continue their existing operations. There would be no impacts to geology or soil resources.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or would continue operation at a reduced capacity. There would be no impacts to geology or soils.

3.3.3 Minimization and Mitigation Measures

KIUC would obtain a National Pollutant Discharge Elimination System (NPDES) Individual Permit from the Clean Water Branch of the DOH for stormwater discharge associated with short-term construction activities. As part of the permit process, KIUC would prepare a construction site Best Management Practices (BMP) plan that would include an erosion and sediment control plan, a site-specific plan to minimize erosion of soil and discharge of other pollutants into State waters, and descriptions of measures that would minimize the discharge of pollutants via stormwater after construction is complete. BMPs would be installed prior to ground-disturbing activities and would be inspected and maintained throughout the construction period.

3.4 Natural Hazards

3.4.1 Existing Conditions

Floods

The Federal Emergency Management Agency (FEMA) creates Flood Insurance Rate Maps (FIRM) that delineate flood hazard areas. The FEMA FIRM flood zone designations include the following:

- A – Areas of 100-year flood, base flood elevations not determined
- AE – Areas of 100-year flood, base flood elevation determined
- XS – Areas of 500-year flood; areas of 100-year flood with average depths of less than one foot or within the drainage area less that one square mile, and areas protected by levees from 100-year flood
- X – Areas determined to be outside the 500-year floodplain
- D – Areas in which flood hazard is undetermined

- VE – Areas of 100-year coastal flood with velocity (wave action), base flood elevations determined (Coastal High Hazard District)

As shown in **Figure 32**, the project facilities are all located in Flood Hazard Zone X (i.e., outside the 500-year floodplain) (FEMA, 2016).

Earthquakes

Strong earthquakes endanger people and property by shaking structures and by causing ground cracks, ground settling, and landslides. The size of an earthquake is commonly expressed by its magnitude on the Richter scale, which is a measure of the relative size of the earthquake wave recorded on seismographs. Thousands of earthquakes occur every year in Hawaiʻi, most on and around the Island of Hawaiʻi. Many of these earthquakes are directly related to volcanic activity. The entire island of Kauaʻi is rated Seismic Hazard Zone A. Zone A is defined as having a "very small probability of experiencing damaging earthquake effects" (USGS, 2017).

Hurricanes and Tropical Storms

The Hawaiian Islands are seasonally affected by Pacific hurricanes from June through November. On average, there are between four and five tropical cyclones observed in the Central Pacific every year. The state has been affected by significant hurricanes over the years. These include Hiki (1950), Nina (1957), Dot (1959), Iwa (1982), ʻIniki (1992), and Iselle (2014) (HNN, 2016a). Hurricane ʻIniki in 1992 passed directly over the island of Kauaʻi as a category 4 hurricane and was the strongest hurricane to ever hit the Hawaiian Islands. According to a report presented at the International Union of Conservation of Nature World Conservation Congress, global climate change could mean that Hawaiʻi may experience more frequent and more severe hurricanes in the future (HNN, 2016).

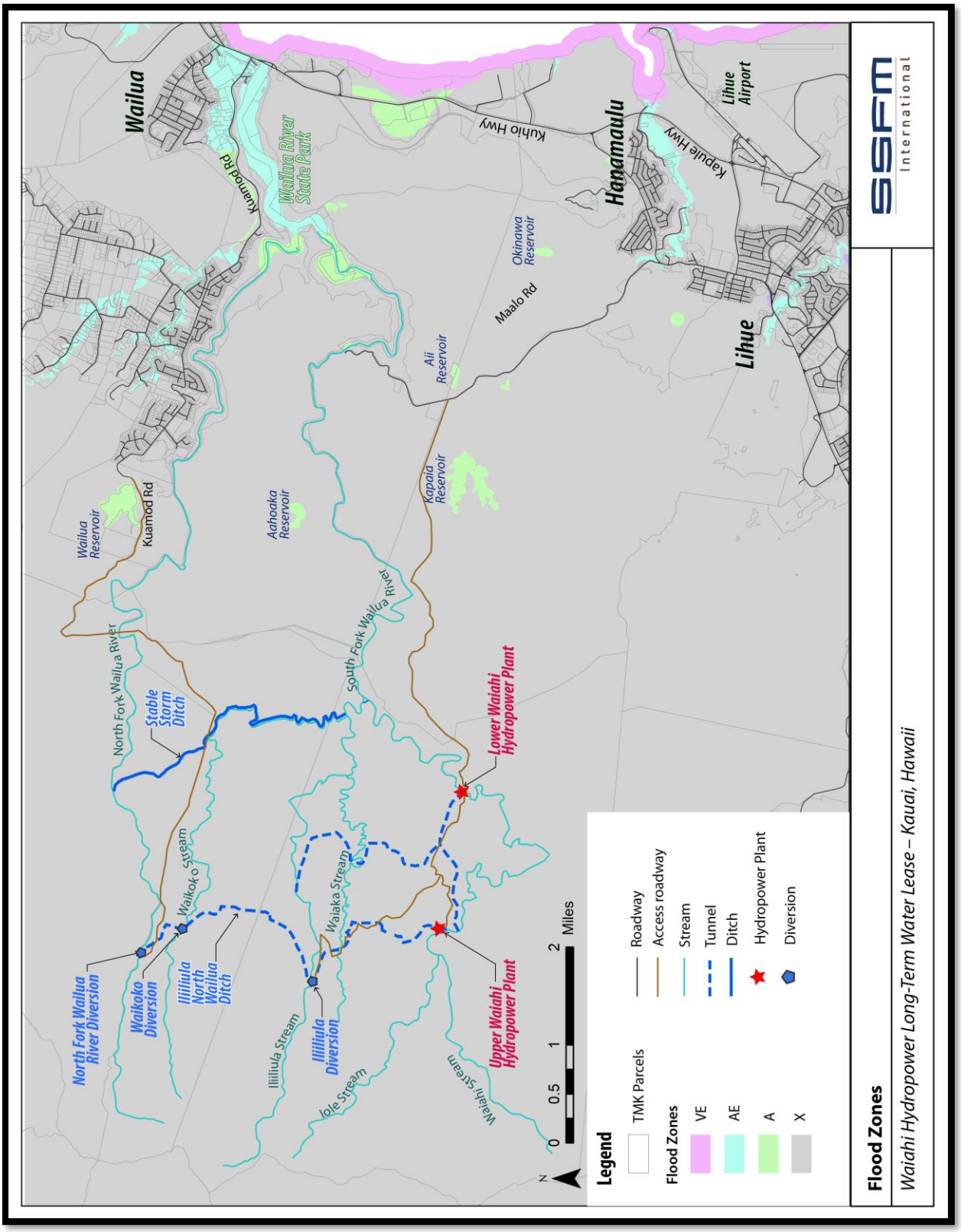
3.4.2 Potential Impacts

Construction

Short-term construction at the Wailua River North Fork and Waikoko Stream Diversions under the Proposed Action would not create conditions that would exacerbate natural hazards. The Kauaʻi Emergency Management Agency coordinates and integrates efforts among all levels of government and the private sector to mitigate against, prepare for, respond to, and recover from natural disasters, acts of terrorism, and other threats and hazards. Construction personnel would respond to any emergency messages or alerts, as appropriate, to ensure their safety during construction.

Under the No-Action Alternative, no construction activities would occur and no conditions would exist that exacerbate natural hazards.

Figure 32. FEMA Flood Hazard Zones



Operation

The Upper and Lower Waiahi Hydropower Plants and associated facilities have been operational for 88 and 105 years, respectively, without significant damage from natural hazards. These facilities were built to withstand their natural environment, and it is expected that they would continue to do so. Both facilities are unmanned. The only time personnel visit the facilities is for inspections and/or maintenance. Personnel would respond to any emergency messages or alerts, as appropriate, to ensure their safety during these visits to the facilities.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or would continue operation at a reduced capacity. Potential impacts associated with natural hazards would be the same as current conditions.

3.4.3 Minimization and Mitigation Measures

No minimization or mitigation measures are proposed or expected to be required.

3.5 Water Resources

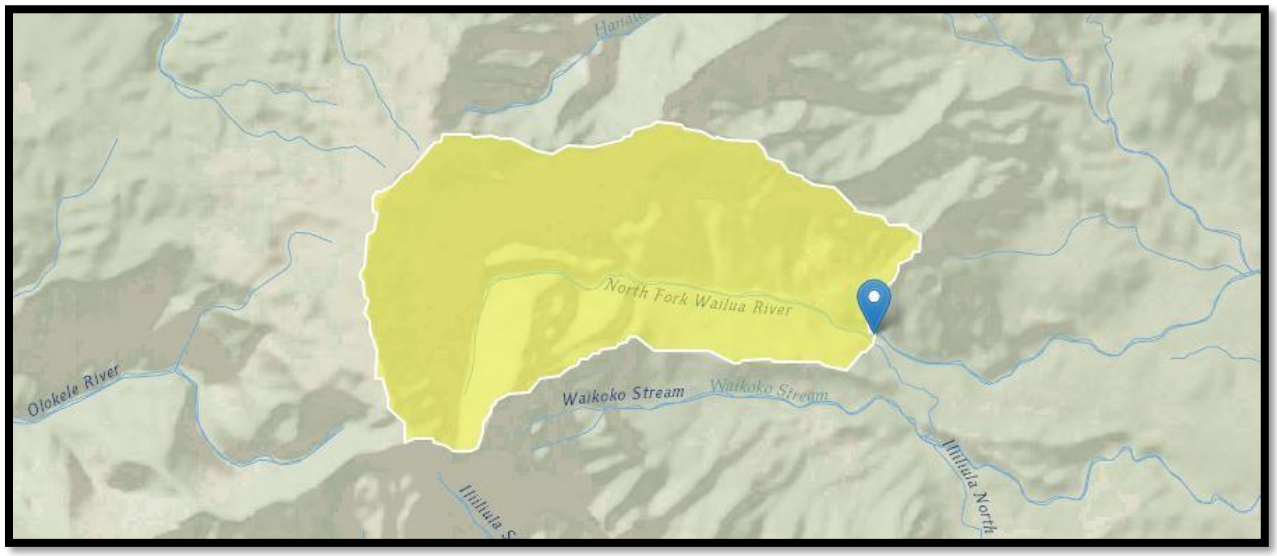
3.5.1 Existing Conditions

Surface Waters and Wetlands

The Proposed Action is located in the Wailua River watershed. The area of the watershed is 52.6 square miles with a maximum elevation of 5,226 feet. The upper portions of the watershed are very steep (Parham et al., 2008).

The watershed above the North Fork Wailua River Diversion was delineated using the USGS StreamStats web application from the location of the North Wailua Ditch near Līhuʻe stream gage (USGS 16061000). The delineated watershed has a total area of 1.79 square miles and is shown in **Figure 33**.

Figure 33. North Fork Wailua River Diversion Watershed



The watershed has a maximum basin elevation of 5,240 feet and a minimum basin elevation of approximately 1,090 feet at the North Fork Wailua River Diversion. Roughly 51% of the drainage area is covered by forested canopy and the mean annual precipitation is roughly 324 inches. Basin characteristics above the diversion structure are provided in **Table 23**.

Table 23. North Fork Wailua River Basin Characteristics above the Diversion

Parameter	Value
Mean Basin Slope (%)	97.2
Canopy Cover (%)	51
Drainage Area [A] (mi2)	1.79
Mean Basin Elevation (ft)	2,740
Maximum Basin Elevation (ft)	5,240
Minimum Basin Elevation (ft)	1,090
Mean Annual Precipitation [P] (in)	324

Source: (USGS StreamStats)

StreamStats was also used to calculate recurrence interval flows using regional regression equations developed for the windward side of Kauaʻi by Oki, et al. (2010). The recurrence interval flows developed using the regression equations are provided in **Table 24**.

Table 24. Recurrence Interval Flows in the North Fork Wailua River Basin

Recurrence Interval	Flow (cfs)
2-year Flood	738
5-year Flood	1,420
10-year Flood	2,000
25-year Flood	2,860
50-year Flood	3,580
100-year Flood	4,380
500-year Flood	6,600

Source: (USGS StreamStats)

The watershed above the Waikoko Stream Diversion was delineated using the USGS StreamStats web application from the location of the Waikoko Stream Diversion. The delineated watershed has a total area of 1.11 square miles and is shown in **Figure 34**. The watershed has a maximum basin elevation of 5,090 feet and a minimum basin elevation of approximately 1,080 feet at the diversion. Roughly 61% of the drainage area is covered by forested canopy and the mean annual precipitation is roughly 268 inches. Basin characteristics above the reservoir are provided in **Table 25**.

StreamStats was also used to calculate recurrence interval flows using regional regression equations developed for the windward side of Kauaʻi by Oki, et al. (2010). The recurrence interval flows developed using the regression equations are provided in **Table 26**.

Figure 34. Waikoko Stream Diversion Watershed

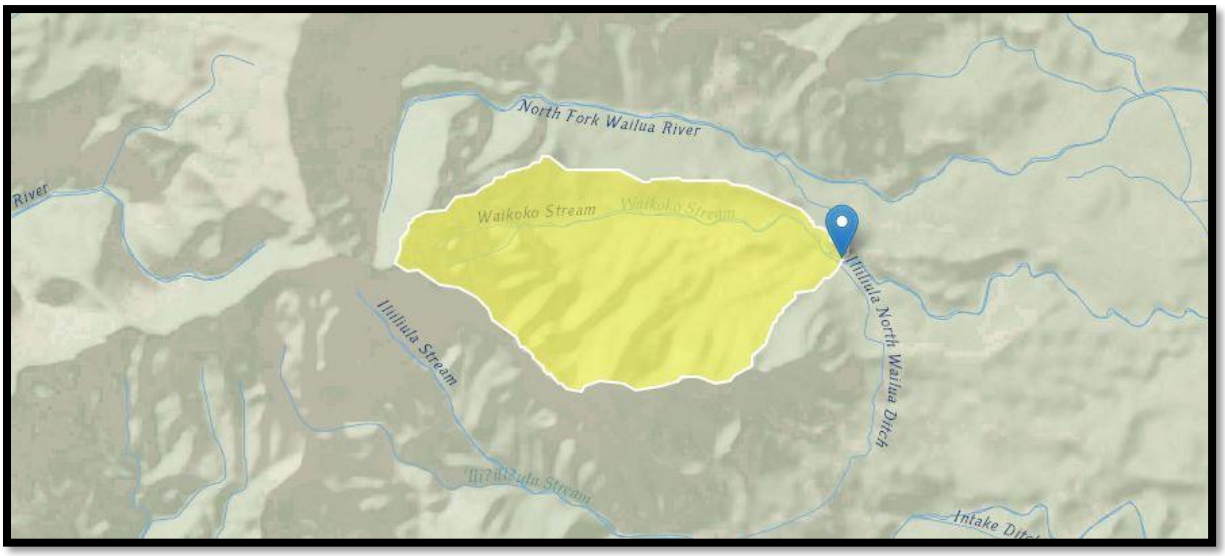


Table 25. Waikoko Basin Characteristics above the Diversion

Parameter	Value
Mean Basin Slope (%)	61.1
Canopy Cover (%)	61
Drainage Area [A] (mi^2)	1.11
Mean Basin Elevation (ft)	2,150
Maximum Basin Elevation (ft)	5,090
Minimum Basin Elevation (ft)	1,080
Mean Annual Precipitation [P] (in)	268

Source: (USGS StreamStats)

Table 26. Recurrence Interval Flows in the Waikoko Basin

Recurrence Interval	Flow (cfs)
2-year Flood	439
5-year Flood	867
10-year Flood	1,240
25-year Flood	1,790
50-year Flood	2,270
100-year Flood	2,800
500-year Flood	4,320

The primary diversions for the Upper and Lower Waiahi Hydropower Plants are located on the North Fork Wailua River, Waikoko Stream, and ʻIliʻiliʻula Stream. Both the Upper and Lower Hydropower Plants are located on Waiahi Stream. All of the waterbodies in the project area are designated Class 2 streams and waterbodies (DOH, 2014). As per the Hawaiʻi State Water Quality Standards set forth in HAR 11-54, Class

2 waters are to be protected for "their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation."

The Wailua River is on the U.S. Environmental Protection Agency's (USEPA) 303(d) list of impaired inland waters during the dry season for turbidity. However, it is a low priority for initiating Total Maximum Daily Loads (TMDL) development within the current monitoring and assessment cycle (DOH, 2018).

There are no wetlands identified on the National Wetland Inventory (NWI) maps (see **Figure 35**) in the project area.

Downstream Water Users

The Upper Līhuʻe and Hanamāʻulu Diversions and Ditch Systems serve a number of agricultural and community interests, and deliver water to state, county, and private land. Hanamāʻulu Ditch provides water to land owned by Grove Farm, County of Kauaʻi, Agribusiness Development Corporation (ADC), and DHHL.

- **Grove Farm Lands:** Grove Farm has over 65 agricultural tenants in the Līhuʻe area that receive irrigation water from these systems. There are 3,800 acres actively used by farmers that receive irrigation water for a variety of agricultural activities. Activities include ranching of both sheep and cattle, growing a variety of vegetables (e.g., mixed greens, taro), growing fruit, and growing tropical flowers. Many of the fruits and vegetables grown by these farmers are sold at the local farmers' market and are served in local restaurants.
- **County of Kauaʻi:** The Hanamāʻulu Ditch provides water to the Kapaia Water Treatment Plant, which treats and delivers drinking water to Kauaʻi County for the greater Līhuʻe area.
- **ADC Lands:** Hanamāʻulu Ditch enters state-owned land managed by ADC known as the Kālepa Lands. Approximately 800 acres of the ADC East Kālepa Lands are irrigable via the Hanamāʻulu Ditch, of which 300 acres are being actively farmed. East Kauaʻi Water Users Cooperative manages the ADC East Kālepa Lands. The ditch systems related to the ADC Kālepa Lands are shown in **Figure 36**.
- **DHHL Lands:** At the most makai and eastern edge of the ADC East Kālepa Lands the Hanamāʻulu Ditch fills Reservoir 21. A tunnel extending from Reservoir 21 through Kālepa Ridge onto the makai side of the ridge historically delivered water from Reservoir 21 to DHHL land. Water needs for DHHL lands are discussed in **Section 4.1.4**.
- **Private Lands:** Kauaʻi Backcountry Adventures, a locally owned business, provides recreational tubing adventures on the Hanamāʻulu Ditch. This is popular with both tourists and locals.

The Upper Līhuʻe Ditch serves farmlands throughout Līhuʻe and all the way to Puhi. The system provides irrigation water for a number of farmers, as well as civic uses including the Līhuʻe Beautification Project that runs along Ahukini Road and the Kāpule Highway, the State Judiciary Complex, the police station, the Vidinha Soccer Field, Kauaʻi Community College, Island School, and Kawaikini Charter School.

There is also an irrigation diversion, Wailua Ditch Intake, on the North Fork Wailua River several miles downstream of the North Fork Diversion that KIUC operates. This diversion is located downstream of the confluence between the East Branch of the North Fork Wailua River and the North Fork Wailua River and delivers water to Wailua Reservoir and farmers to the north of the reservoir all the way to Kapahi. This system is shown in the East Kauaʻi Irrigation System Map in **Figure 37**.

Figure 35. NWI Wetlands

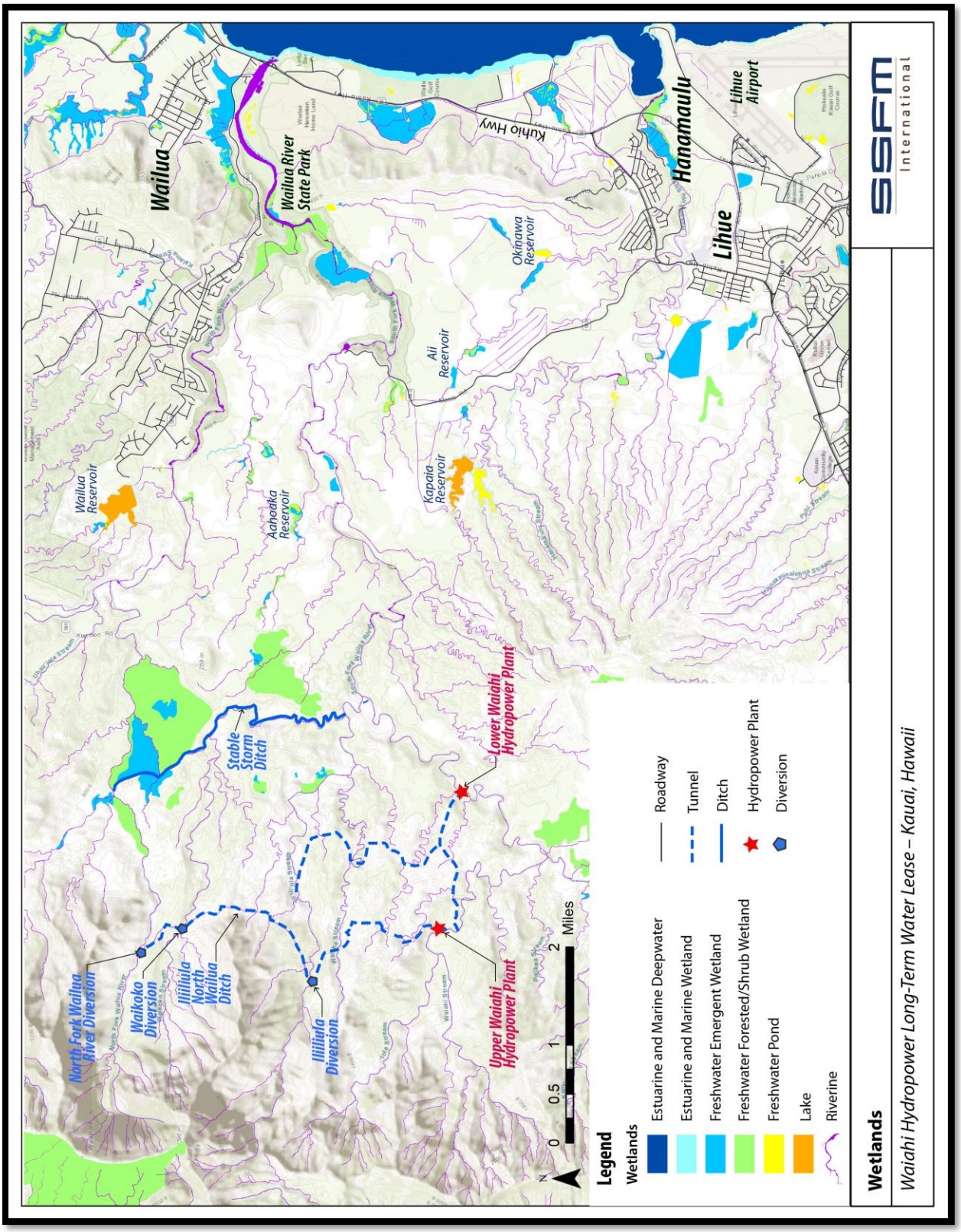
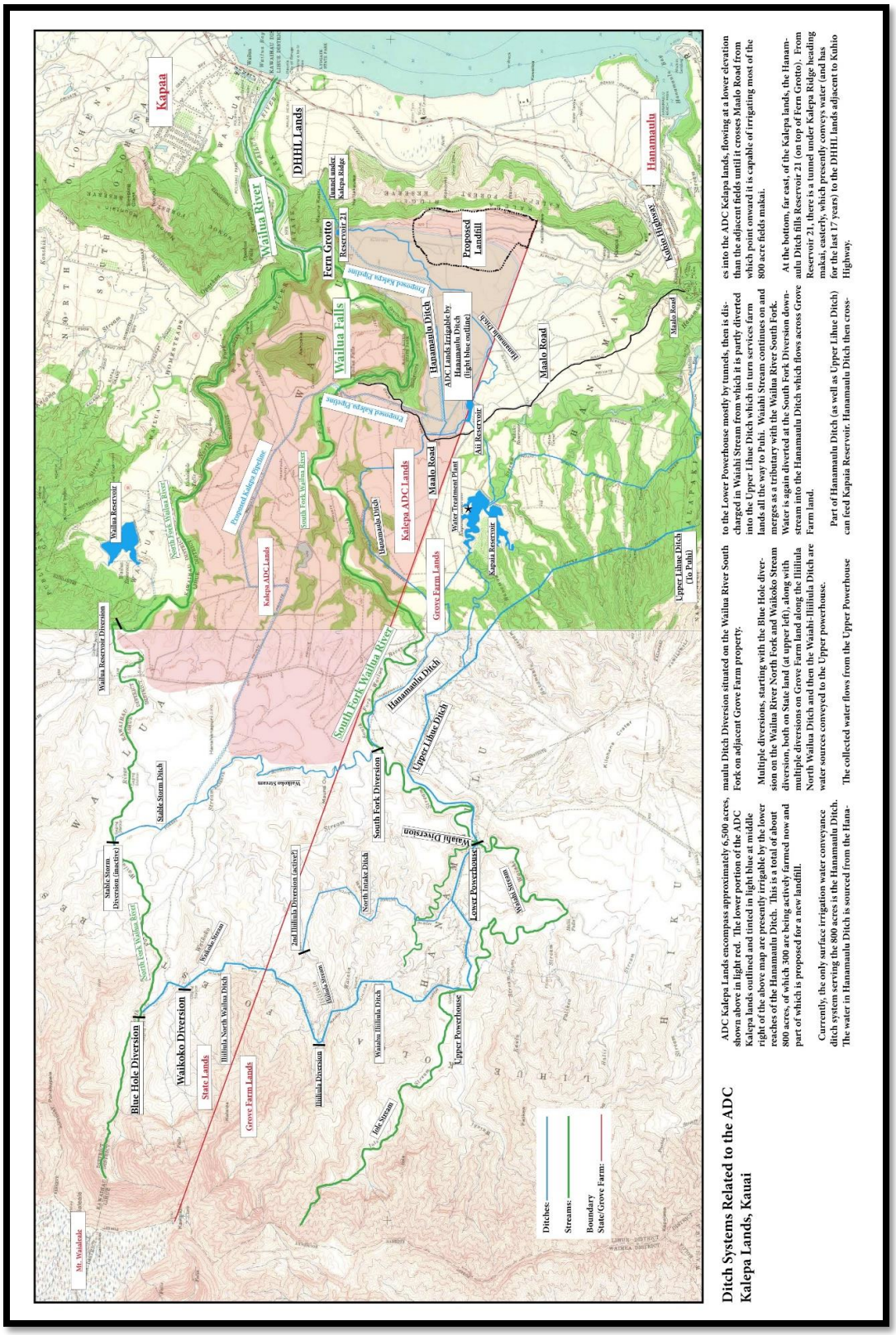
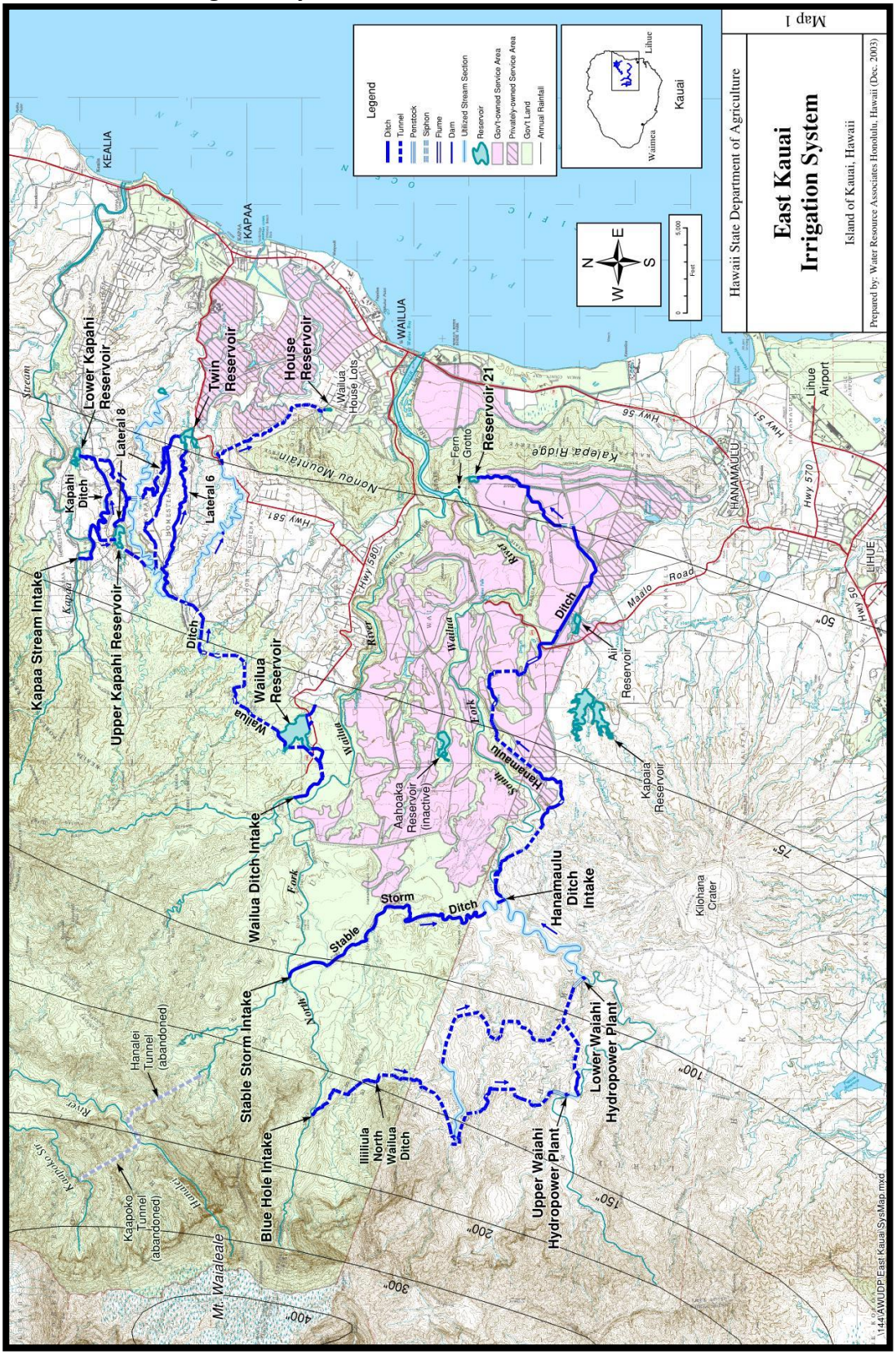


Figure 36. Map of ADC Kālepa Lands served by Hanamāʻulu Ditch



Source: DLNR, 2018

Figure 37. East Kauaʻi Irrigation System



While KIUC does not deliver water directly to any of these downstream water users, the ʻIliʻiliʻula North Wailua Ditch was designed and constructed to supplement the volume of water available in the South Fork Wailua River area with water from the North Fork Wailua River and continues to function in the same way today. The agricultural uses and water needs are less than during the sugar plantation era. However, it is evident through operational experience and observation that when the North Fork Wailua River Diversion is not operating, there is a notable impact on the water volume available to the Upper Līhuʻe and Hanamāʻulu Ditch systems, especially during drier months of the year. Although there isn't enough hydrology and water data available to quantify the impacts to the downstream users on these systems, impacts have been observed. KIUC has for many years made an effort to avoid scheduling shut downs necessary for maintenance and repairs of the North Fork Wailua River Diversion during the months of July, August, and September or other notably dry periods. A reduction of diversion volume at the North Fork Wailua River would impact downstream users during the dry season and possibly during shoulder periods between seasons.

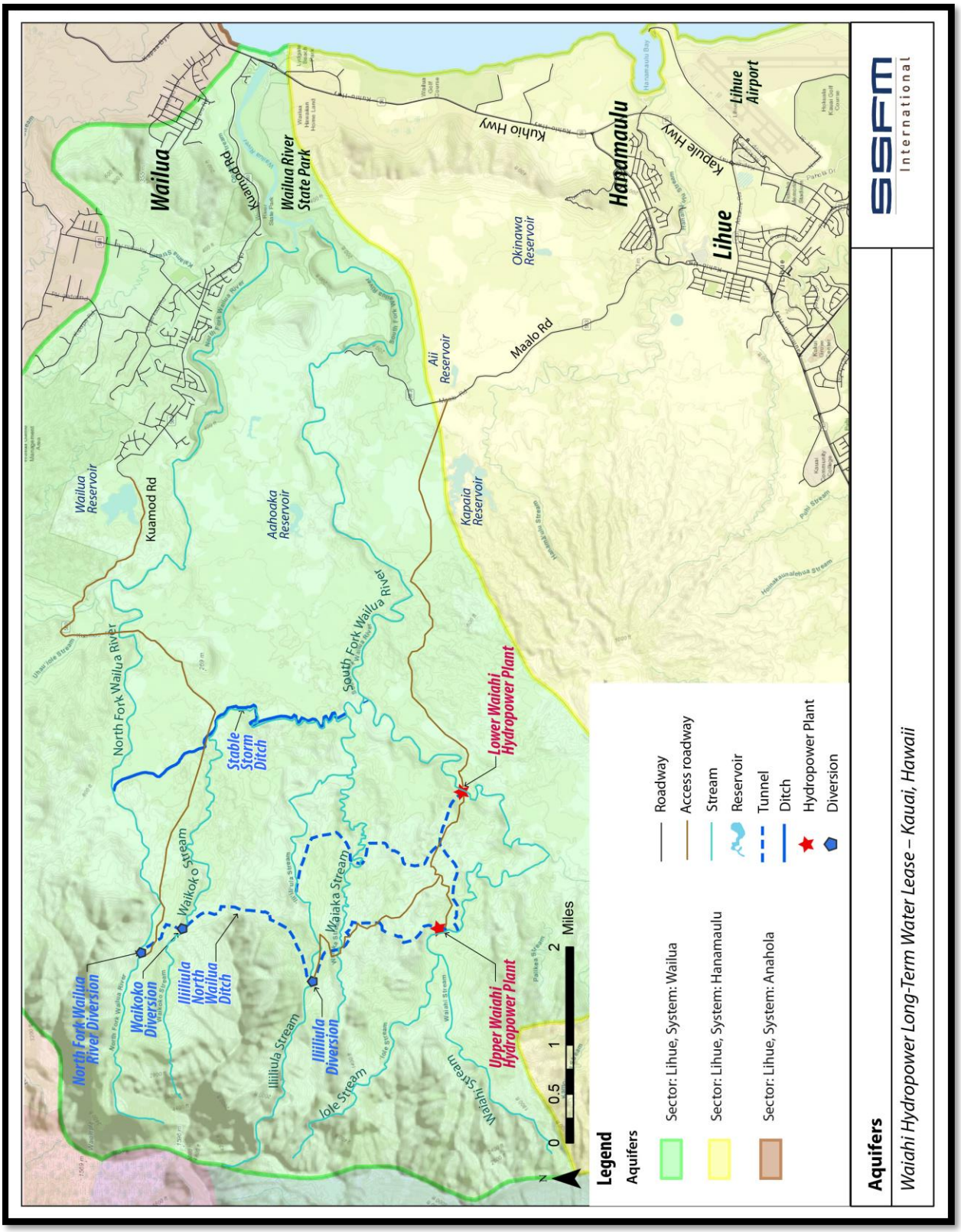
Groundwater

As shown in **Figure 38**, the project area overlays the Wailua Aquifer System within the Līhuʻe Aquifer Sector. The Wailua Aquifer System is a high level, unconfined, perched system. Fresh water in the aquifer is not in contact with seawater, the water table is upper surface of the saturated aquifer, and the aquifer is on an impermeable layer. This system has potential use and is used as a drinking water source. It is irreplaceable and has a high vulnerability to contamination (Mink and Lau, 1992).

USGS, in cooperation with the County of Kauaʻi Department of Water, has conducted studies on ditch systems' contribution to ground water recharge. In 2006, USGS published *Effects of Irrigation, Drought, and Ground-Water Withdrawals on Ground-Water Levels in the Southern Līhuʻe Basin, Kauaʻi, Hawaiʻi*. Overall results of the study indicate that irrigation reduction, specifically the decrease in water diverted from surface water sources for irrigation between 1981 and 2000 and the shift from furrow irrigation to drip irrigation, have a measurable impact to rates of recharge in groundwater levels. While groundwater recharge is impacted by both drought and irrigation, the study results showed that modeled scenarios with no diversion/irrigation under normal rainfall conditions produced a significant impact to ground water recharge rates (pg. 20 and 23). In summarizing study implications, the report states the following:

> *"The steady-state and transient simulations both indicate that of the three factors examined in this study (drought, irrigation, and ground-water withdrawal), irrigation changes resulted in the largest effects on water levels….when both magnitude and duration are considered." (pg 36)*
>
> *"These results indicate that the primary cause of the observed decline in water levels...was the reduction and ultimate cessation of sugarcane irrigation in the late 20th century." (pg 36)*
>
> *"The steady-state simulations also indicate that, given enough time, the decrease in irrigation that occurred between 1981 and 1998 could theoretically lower ground-water levels in parts of the southern Līhuʻe Basin by as much as 100 ft." (pg 37)*

Figure 38. Aquifers



3.5.2 Potential Impacts

Construction

Construction of the Proposed Action may produce sediment from soil erosion during and after excavation and construction at the construction areas at the North Fork Wailua River and Waikoko Stream Diversions, which may impact water quality at the construction site as well as downstream watercourses. Contaminants associated with equipment during construction may impact surface water and groundwater. Construction plans and specifications would include BMPs to minimize erosion on the project site during and after construction, as well as measures to contain runoff on-site during construction. Temporary erosion control measures would be used during construction to prevent soil loss and to minimize surface runoff into adjacent areas and the North Fork Wailua River and Waikoko Stream. Additionally, both construction areas are largely free of soil and fines, consisting primarily of rock, cobble, gravel, and existing concrete, so erosion and sediment transport associated with construction are anticipated to be minimal. Therefore, impacts to water resources during the short-term construction period would be less than significant.

Under the No-Action Alternative, no construction activities would occur and therefore there would be no construction related impacts.

Operation

Water used by the Upper and Lower Waiahi Hydropower Plants is returned to Waiahi Stream. The final combined system discharge point is at the Lower Waiahi Hydropower Plant tailrace where water is returned to Waiahi Stream just upstream of the Upper Līhuʻe Diversion operated by Grove Farm. Water discharged from the tailrace at this location is a combination of water collected at the North Fork Wailua River, Waikoko Stream, ʻIliʻiliʻula Stream, and Waiahi Stream Diversions. Water conveyed from the North Fork Wailua River to the Upper Waiahi Hydropower Plant is subsequently diverted along with Waiahi Stream flow to the Lower Waiahi Hydropower Plant, which increases the water volume available in Waiahi Stream downstream of the Lower Waiahi Hydropower Plant tailrace for water use needs on the Upper Līhuʻe and Hanamāʻulu Ditches, thus benefitting downstream water users.

Operation of the Proposed Action would maintain the reduced diversion volumes after the IFS is met at the North Fork Wailua River and Waikoko Stream Diversions. KIUC would make permanent modifications to the diversion structures, as discussed in **Section 2.1.2**, to ensure the IFS established by CWRM remains in the stream channel at all times. Therefore, there would be beneficial impacts to surface waters compared to current conditions.

There have been no reported or observed impacts to the Wailua Ditch Intake during full operations at the North Fork Wailua River Diversion and no impacts are anticipated in the future. The East Branch confluence, in addition to the upstream confluence of Maheo Stream, both of which are sizeable volume contributions, and the fact that studies indicate the North Fork Wailua River is an overall gaining stream, indicates there is ample water at the point of the Wailua Ditch Intake. During the plantation era this diversion was operating at full capacity as were the two upstream diversions, Stable Storm and North Fork Wailua River Diversion, indicating that the East Branch North Fork contribution alone is sufficient to meet the needs for the Wailua Ditch system.

Operation of the Upper and Lower Waiahi Hydropower Plants would not cause water pollution as no foreign objects or chemicals are introduced to the water during its passage through the penstock or turbine. Additionally, there is no heat removal or addition to the water as it passes through the plant. KIUC has no plans to make any changes to the existing systems that would create a potential for temperature, chemical, or foreign object introduction into the water and is committed to maintaining that policy for the duration of the project. Operation activities associated with the Proposed Action would be the same as current operations; therefore, there would be no impact to water quality of surface waters from operation of the Proposed Action.

Development of a Watershed Management Plan is required as part of the statutory requirements for obtaining a water lease (HRS 178-58). KIUC has been in communication with DOFAW on several occasions regarding ways to satisfy the watershed management plan requirements as they pertain to the water lease. It is KIUC's understanding that DOFAW and DLNR's Land Division have jointly developed a proposed *Watershed Management and Protection Cost Share Formula and Contribution for Leases of Water Rights*, which was submitted to the BLNR on March 22, 2019 but has yet to be adopted. KIUC is continuing to coordinate with DOFAW on alternatives to watershed management in the Wailua watershed.

Operation of the Proposed Action would benefit groundwater recharge rates in the area.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or continue operation at a reduced capacity. Under the No-Action Alternative, the North Fork Wailua River and Waikoko Stream Diversions and the portions of the ʻIliʻiliʻula North Wailua Ditch on state land would become the responsibility of DLNR. In this event it is unclear what would happen to these state and community assets, and it is possible that they would continue to deteriorate to the point of being unusable as a resource for the community. Retaining all water in the stream would require either removal of the diversions or modifications at both spillways. Without one of these actions being implemented, water will continue to be diverted into the ditch inlets. Also, under the No-Action alternatives there would be negative impacts to groundwater recharge rates in the area, as well as negative impacts to downstream agricultural, public water supply, and eco-tourism uses.

3.5.3 Minimization and Mitigation Measures

KIUC would obtain all required permits and comply with permit conditions to minimize impacts to water resources. Permits would include:

- National Pollutant Discharge Elimination System (NPDES) Individual Permit from the Clean Water Branch of the DOH for stormwater discharge associated with construction activities
- NPDES Dewatering Permit from the Clean Water Branch of the DOH for discharges associated with construction activity dewatering
- Section 401 Water Quality Certification from the Clean Water Branch of the DOH
- Section 404, Clean Water Act permit from the U.S. Army Corps of Engineers (USACE)

In addition, the following BMPs would be implemented to minimize impacts to the aquatic environment during construction:

- Turbidity and siltation from project-related work would be minimized and contained within the project area by silt containment devices, which would be maintained for the life of the construction period and until the project area is stabilized.

- No work would occur during adverse weather conditions or flooding.
- All project construction-related debris and sediment containment devices would be removed and disposed of at an approved site.
- All project construction-related materials and equipment to be placed or used in an aquatic environment would be inspected for pollutants including, but not limited to, grease, oil, etc., and cleaned to remove pollutants prior to use.
- Fueling of project-related vehicles and equipment would take place away from the aquatic environment. A contingency plan for accidental spills of petroleum products would be developed and retained on-site. Absorbent pads and containment booms would be stored on-site to facilitate clean-up of accidental petroleum releases.
- Project construction-related materials would not be stockpiled in or in close proximity to aquatic habitats and would be protected from erosion to prevent materials from being carried into waters by wind or rain.
- All deliberately exposed soil or under-layer materials used near water would be protected from erosion and stabilized as soon as possible with geotextile, filter fabric, vegetation matting, or hydroseeding.

3.6 Biological Resources

3.6.1 Existing Conditions

A flora and fauna survey was conducted of the project area in September 2018. The objectives of the survey were to determine whether vegetation types and species found during previous surveys and mapping efforts were still present in the survey areas and to record any notable changes. Rocky outcrops, cliffs, gulches, streamsides, and other areas likely to contain native species were closely examined. The survey effort included windshield and pedestrian surveys, as well as aerial surveys. Both visual observations and vocalization identifications were recorded.

In addition to the pedestrian survey, an analysis was performed in ArcMap to link special-status plants to the Hawaiʻi Gap Analysis Program (HIGAP) vegetation classes (Gon et al., 2006) where they are most likely to occur. This was completed by intersecting the U.S. Fish and Wildlife Service (USFWS) Critical Plant Habitat shapefile with the HIGAP raster to calculate which HIGAP vegetation classes were found within each critical habitat polygon.

The complete *Terrestrial Flora and Fauna Technical Report for the Proposed Waiahi Hydropower Project* is included in **Appendix C** of this EA.

A stream habitat assessment was conducted in the project area in 2013. Specifically, the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) model was used to assess the environmental impacts of the Upper and Lower Waiahi Hydropower Plants on the native stream animals and their habitats. In 2018, the HSHEP assessment was updated. The update included a survey of instream habitat and biota, a seepage run in the North Fork Wailua River and Waikoko Stream, and the results integration into the HSHEP model to update the results for the native amphidromous stream animals, including five fish, two crustaceans, and one mollusk. The complete *Assessment of Stream Diversions associated with the Upper and Lower Waiahi Hydropower System using the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) Model* is included in **Appendix D** of this EA.

Flora

The HIGAP vegetation data layer was determined to be highly representative of the survey areas. Two vegetation cover types were observed: alien forest and alien grassland.

Alien Forest

Alien forest comprised the majority of the project area. Alien forest is described as "mixed, typically dense canopies of alien tree species, often plantation forest planting, with dominants including but not limited to: *Eucalyptus, Casuarina, Falcataria, Araucaria, Fraxinus, Melaleuca, Psidium,* and *Grevillea* spp." (Gon et al., 2006). Dominant overstory species in the project area varied with location, elevation, and rainfall levels. Understory species were uncommon due to the dense shade provided by the overstory. Dominant overstory and understory species identified during the field survey are shown in **Table 27**.

Table 27. Dominant Flora Species within the Project Area

Common Name	Scientific Name	Location(s)
Overstory Species		
Albizia	*Falcataria moluccana*	North Fork Wailua River Diversion Waikoko Stream Diversion Lower Waiahi Forebay Lower Waiahi Powerhouse
Strawberry guava	*Psidium cattleianum*	North Fork Wailua River Diversion Waikoko Stream Diversion ʻIliʻiliʻula Stream Diversion Upper Waiahi Forebay Upper Waiahi Powerhouse Lower Waiahi Forebay
ʻŌhiʻa	*Metrosideros polymorpha*	North Fork Wailua River Diversion Waikoko Stream Diversion ʻIliʻiliʻula Stream Diversion Upper Waiahi Forebay Upper Waiahi Powerhouse Lower Waiahi Powerhouse
Understory Species		
Clidemia	*Clidemia hirta* var. *hirta*	North Fork Wailua River Diversion Waikoko Stream Diversion ʻIliʻiliʻula Stream Diversion Upper Waiahi Forebay Upper Waiahi Powerhouse Lower Waiahi Forebay Lower Waiahi Powerhouse

Common Name	Scientific Name	Location(s)
Prickly Florida blackberry	*Rubus argutus*	North Fork Wailua River Diversion Waikoko Stream Diversion ʻIliʻiliʻula Stream Diversion Upper Waiahi Forebay Upper Waiahi Powerhouse Lower Waiahi Forebay Lower Waiahi Powerhouse
Uluhe (native fern)	*Dicranopteris linearis*	North Fork Wailua River Diversion Waikoko Stream Diversion ʻIliʻiliʻula Stream Diversion Upper Waiahi Forebay Upper Waiahi Powerhouse Lower Waiahi Forebay Lower Waiahi Powerhouse

Alien Grassland

Non-native lawn and ruderal grasses, along with a variety of cultivated species, were identified in the project area. Species identified in the alien grassland vegetation type are shown in **Table 28**.

Table 28. Species Identified in the Alien Grassland Vegetation Type

Common Name	Scientific Name
Narrow-leaved carpetgrass	*Axonopus fissifolius*
Swollen fingergrass	*Chloris barbata*
Job's tears	*Coix lachryma-jobi*
Barnyard grass	*Echinochloa crusgalli*
Basketgrass	*Oplismenus hirtellus*
Guinea grass	*Urochloa maxima*
Hilo grass	*Paspalum conjugatum*
Glenwood grass	*Sacciolepis indica*
Barbas de indio	*Andropogon bicornis*
Coconut	*Cocos nucifera*
Avocado	*Persea Americana*
Mango	*Mangifera indica*
Ti	*Cordyline fruticosa*
Banana	*Musa* hybrid
Turk's cap	*Malvaviscus penduliflorus*

Fauna

Fauna observed in the survey area includes species that are indigenous, migratory, and non-native introductions. A total of 14 birds, 2 mammals, 2 reptiles/amphibians, and 9 invertebrates were observed during the fauna survey, as shown in **Table 29**. These species are expected to occur throughout the project area, although the indigenous and migratory species often require specific niche habitats and are frequently locally abundant where they occur. The non-native introduced species are more generalist and often occupy a broad range of habitats.

Table 29. Fauna Species Observed During the Fauna Survey

Common Name	Scientific Name	Status
Birds		
Black-crowned night heron	*Nycticorax*	I, MBTA
Brazilian cardinal	*Paroaria coronata*	NN
Cattle egret	*Bubulcus ibis*	NN, MBTA
Chestnut munia	*Lonchura atricapilla*	NN
Common myna	*Acridotheres tristis*	NN
Feral chicken	*Gallus domesticus*	NN
House finch	*Haemorhous mexicanus*	NN, MBTA
Japanese white-eye	*Zosterops japonicus*	NN
Melodious laughingthrush	*Garrulax canorus*	NN
Nutmeg mannikin	*Lonchura punctulata*	NN
Pacific golden-plover	*Pluvialis fulva*	M, MBTA
Rose-ringed parakeet	*Psittacula krameri*	NN
White-tailed tropicbird	*Phaethon lepturus*	I, MBTA
White-rumped shama	*Copsychus malabaricus*	NN
Mammals		
Feral pig	*Sus scrofa*	NN
Feral cat	*Felis catus*	NN
Terrestrial Reptiles and Amphibians		
Metallic skink	*Lampropholis delicate*	NN
American bullfrog	*Rana catesbeiana*	NN
Insects and Other Invertebrates		
House fly	*Musca domestica*	NN
Honey bee	*Apis sp.*	NN
Potter wasp	*Nesodynerus sp.*	NN
Damselfly	*Megalagruin spp.*	End.
Green darner	*Anax junius*	NN
Black witch moth	*Ascalapha odorata*	NN
Cabbage white	*Pieris rapae*	NN
Mosquito	*Aedes sp.*	NN
Rosy wolfsnail	*Euglandina rosea*	NN

I = Indigenous; NN = Non-native permanent resident; M = Migratory; End. = Endemic; MBTA = Migratory Bird Treaty Act

Stream Habitat and Biota

Surveys of the North and South Forks of the Wailua River were completed during the weeks of February 11 through 14 and June 12 through 20 in 2018. A total of 17 areas were sampled: eight in the North Fork Wailua River and nine in the South Fork Wailua River.

The North Fork Wailua River was surveyed above the North Fork Wailua River Diversion to the lower reach below Kaholalele Falls. There were six native species and five introduced species observed, as shown in **Table 30**. Habitat along this section of the North Fork Wailua River consisted of pool, run, riffle, cascade, and falls habitats. There were no areas of side pools or dry streambed along this stretch of the North Fork Wailua River.

The South Fork Wailua River was surveyed in Waikoko, ʻIliʻiliʻula, and Waiahi Streams, as well as in the main stem of the South Fork Wailua River below Wailua Falls. There were six native species and seven introduced species observed, as shown in **Table 30**, although only ʻōpae were present at the diversion structures. Habitat along these tributaries to the South Fork Wailua River consisted of pool, run, riffle, cascade, and side pool habitats. There were no areas of falls or dry streambed at the survey locations along the tributaries. Habitat along the South Fork Wailua River between the area below the Upper Waiahi Hydropower Plant return and below Wailua Waterfall consisted of pool, run, and riffle habitat. There were no areas of cascade, falls, side pool, or dry streambed along this stretch of the South Fork Wailua River.

Table 30. Species Observed during Stream Surveys

Common Name	Scientific Name	North Fork Wailua River	South Fork Wailua River
Native Species			
ʻŌpae kalaole	*Atyoida bisulcata*	C/P	C/P
ʻOʻopu ʻalamoʻo	*Lentipes concolor*	--	P*
ʻOʻopu nākea	*Awaous stamenius*	C	C
ʻOʻopu ʻakupa	*Eleotris sandvicensis*	P	C
ʻOʻopu naniha	*Stenogobius Hawaiʻiensis*	C	C
ʻŌpae ʻoehaʻa	*Macrobrachium grandimanus*	P	--
Damselfly species	*Zygoptera sp.*	P	--
Introduced Species			
Smallmouth bass	*Micropterus dolomieu*	C/P	C/P
Tahitian prawn	*Macrobrachium lar*	C/P	P
Guppy	*Poecilia reticulata*	P	C/P
Green swordtail	*Xiphophorus hellerii*	P	P
Crayfish	*Procambarus clarkia*	--	P
Cane toad	*Bufo marinus*	P	P
Bull frog	*Rana catesbeiana*	--	P

C = Common; P = Present; -- = not observed; * = migrating post-larval fish

Special Status Species

Special status species refers to those species listed by the USFWS and/or the State of Hawaiʻi as threatened, endangered, or candidate. The USFWS and State of Hawaiʻi lists eight endangered species that may occur in the survey areas, as shown in **Table 31**.

Table 31. Special Status Species with Potential to Occur in the Project Area

Common Name	Scientific Name	Status Federal/State
Hawaiian moorhen	*Gallinula galeata sandvicensis*	E/E
Hawaiian duck	*Anas wyvilliana*	E/E
Hawaiian goose	*Branta sandvicensis*	E/E
Hawaiian petrel	*Pterodroma sandwichensis*	E/E
Band-rumped storm-petrel	*Oceanodroma castro*	C/E
Newell's shearwater	*Puffinus auricularis newelli*	T/T
Hawaiian hoary bat	*Lasiurus cinerus semotus*	E/E
Newcomb's snail	*Erinna newcombi*	T/T

E = Endangered; T = Threatened; C = Candidate

Hawaiian Waterbirds

The Hawaiian moorhen and the Hawaiian duck constitute the Hawaiian waterbirds group. Hawaiian waterbirds are most likely to be found in areas associated with wetlands and waterways, including freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro patches, irrigation ditches, sewage treatment ponds, and montane streams and marshlands. Hawaiian waterbirds are known to feed on aquatic plants, snails, beetles, true bugs, ants and wasps, flies, spiders, crustaceans, dragonflies and damselflies, leeches, and other aquatic invertebrates. The nesting season for Hawaiian waterbirds are generally during the summer months, but nesting may occur as early as April and as late as mid-September. The Hawaiian duck has been observed to nest as early as March after heavy rains. There are no records of Hawaiian waterbirds nesting in the project area; however, they could forage in the alien grassland vegetation type, wetlands, and waterways in the project area.

Hawaiian Goose

The Hawaiian goose is adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian Islands with negligible dependence on freshwater habitat. The Hawaiian goose uses a variety of habitats ranging from beach strand, shrubland, grassland, and lava rock. They feed on leaves and seeds of grasses and sedges and leaves and flowers of various fruits of several species of shrubs. The Hawaiian goose is known to nest under ʻōhiʻa and ʻamaʻu and could nest under these species in the alien forest vegetation type. The Hawaiian goose nests generally during summer months, similar to Hawaiian waterbirds. Suitable foraging habitat for the Hawaiian goose is located in the alien grassland vegetation type.

Hawaiian Seabirds

The Hawaiian petrel, band-rumped storm-petrel, and Newell's shearwater constitute the Hawaiian seabirds group. There is not appropriate nesting or foraging habitat for these species in the project area. However, they may traverse over the project area while flying between their upland nest colonies and the ocean where they forage. During the fledging season from September 15 to December 15, young seabirds

may become attracted to bright lights or artificially lighted areas. Some birds become disoriented and exhausted causing them to fall to the ground or strike utility structures and buildings.

Hawaiian Hoary Bat

Hawaiian hoary bat occurs on the island of Kauaʻi in native, non-native, agricultural, and developed landscapes. Hawaiian hoary bats forage in open, wooded, and linear habitats with a wide range of vegetation types. These animals are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands up to 300 feet offshore. Hawaiian hoary bats typically roost in trees greater than 16 feet with dense canopy foliage or in the subcanopy when the canopy is sparse and there is open access for launching into flight.

The potential for the presence of Hawaiian hoary bat was assessed based on the presence of suitable habitat. The Hawaiian hoary bat has been documented roosting in ʻōhiʻa, albizia (*Falcataria moluccana*), ironwood (*Casuarina equisetifolia*), eucalyptus (*Eucalyptus* spp.), avocado (*Persea Americana*), and mango (*Mangifera indica*) and could roost in trees similar in structure. In addition, the Hawaiian hoary bat could forage over the forest and grassland habitat types throughout the survey areas.

Newcomb's Snail

Newcomb's snail at Blue Hole headwater
September 30, 2017

The microhabitat conditions preferred by the Newcomb's snail appear limited to small areas in flowing spring-fed tributaries or waterfalls adjacent to main channels of springs. Specific habitat requirements include fast-flowing freshwater streams with stable springs, rock seeps, and vertical-to-overhanging waterfalls. Most snail populations are found at an elevation of about 1,000 feet. This snail is limited to ten small stream and spring sites within six watersheds in the mountainous interior of the island of Kauaʻi and is rarely found in the main stream channels. The Newcomb's snail is believed to feed on algae and vegetation growing on submerged rocks. Threats to the Newcomb's snail include reduced stream flow from drought, water diversion projects, or other natural and human causes; predation by introduced snails, flies, and aquatic species; and small population dynamics (USFWS, no date).

The North Fork Wailua River Diversion borders designated critical habitat for the Newcomb's snail. Newcomb's snail are known to occur approximately 1.5 miles upstream of the North Fork Wailua River Diversion at the Blue Hole headwaters. However, during USFWS surveys and other biological surveys, no Newcomb's snail have been observed at the North Fork Wailua River or Waikoko Stream Diversions or at any locations downstream, nor are they expected to be present.

3.6.2 Potential Impacts

Construction

Terrestrial Biological Resources

Construction activities at the North Fork Wailua River and Waikoko Stream Diversions would have short-term impacts on biological resources. The noise and concentrated human activity in the normally undisturbed area would temporarily disrupt the habitat for the various species of birds and mammals that are known to exist in the area. Wildlife is expected to retreat from the area while construction is taking place but return after the project is in operation. Construction could result in the removal of minimal amounts of vegetation at the diversions. Since construction would be short-term and temporary and vegetation removal would be minimal, it is expected that construction of the Proposed Action would have less than significant impacts on terrestrial flora and fauna.

Stream Biota and Habitat

Aquatic species may be impacted by increased turbidity and sedimentation from the construction at the North Fork Wailua River and Waikoko Stream Diversions. Construction plans and specifications would include BMPs to minimize erosion on the project site during and after construction, as well as measures to contain runoff on-site during construction. Temporary erosion control measures would be used during construction to prevent soil loss and to minimize surface runoff into adjacent areas and streams. Therefore, impacts to aquatic species during construction would be less than significant.

Special Status Species

Hawaiian waterbirds and the Hawaiian goose are known to occasionally use streams and irrigation ditches primarily for feeding, although none have been seen in the project area. Construction activities at the North Fork Wailua River and Waikoko Stream Diversions could have short-term and temporary impacts to foraging Hawaiian waterbirds. However, construction activities would be limited to two areas and it is expected that Hawaiian waterbirds, if present, would retreat from the area while construction is taking place and utilize other nearby streams and ditches for foraging. Although there are no known records of nesting within the project area, mitigation measures described in **Section 3.6.3** would be implemented to minimize potential impacts to Hawaiian waterbirds and the Hawaiian goose.

Impacts to seabirds could occur from the use of nighttime lighting during construction. Artificial lighting can adversely impact seabirds that may pass through the area at night causing disorientation, which could result in collision with manmade objects or grounding of birds. Impacts to seabirds would be minimized to the extent practicable through the implementation of mitigation measures described in **Section 3.6.3**.

Impacts to the endangered Hawaiian hoary bat could occur due to vegetation removal, which may occur at the North Fork Wailua River and Waikoko Stream Diversions. During clearing, grubbing, or tree trimming/cutting, the removal of tall, woody vegetation can temporarily displace bats using the vegetation for roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is likely to be minimal. However, during the pupping season from about June 1 to September 15 each year, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage, and very small pups may be unable to flee a tree that is being felled. Impacts to the

endangered Hawaiian hoary bat would be minimized to the extent practicable, as described below in **Section 3.6.3**.

Impacts to the Newcomb's snail are not expected as surveys in the area have failed to detect the presence of the Newcomb's snail in the project area. There has only been one sighting in the project vicinity, which was in 1995 and upstream of the North Fork Wailua River Diversion. In addition, full stream flow would continue during construction and would be routed in the stream channel away from the construction area using cofferdams.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to biological resources.

Operation

The Upper and Lower Waiahi Hydropower Plants have been in operation for over 80 years. Therefore, there would be no change from current conditions to terrestrial biological resources during operation of these plants.

Under the Proposed Action, water would be retained in the stream as required by the IFS set by CWRM. As previously stated in **Section 1.7**, the IFS is the "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses" (HAR 174C-3). Therefore, operation of the Upper and Lower Waiahi Hydropower Plants in compliance with the IFS would have beneficial impacts to stream biota and habitat compared to current conditions.

Results of the HSHEP model revealed the following potential impacts from operation of the Proposed Action:

- Non-climbing amphidromous stream species, which include ʻoʻopu naniha, ʻoʻopu ʻakupa, and ʻōpae ʻoehaʻa are generally restricted to stream segments below the first major waterfall; therefore, there would be no impacts to these species or their habitat.
- Climbing amphidromous stream species, excluding ʻōpae kalaole have most of their habitat far downstream of the Upper and Lower Waiahi Hydropower facilities; therefore, there would be no impacts to these species or their habitat.
- ʻŌpae kalaole has the most habitat within the area of the Upper and Lower Waiahi Hydropower Plants and were observed during stream biota surveys upstream of the North Fork Wailua River, Waikoko Stream, and ʻIliʻiliʻula Stream Diversions. They were also observed within the ditches and tunnels. Restoring low flow as delineated in the recommended IFS would provide consistent water flow below the diversions and would increase suitable habitat, improve passage, and decrease entrainment for the ʻōpae kalaole. Therefore, operation of the Proposed Action would have beneficial impacts for the ʻōpae kalaole compared to current conditions.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or continue operation at a reduced capacity. The North Fork Wailua River and Waikoko Stream Diversions and the portion of ditch system on state land would revert to DLNR. In this event it is unclear what would happen to the structures. Without removal of the structures or modifications, water would continue to be diverted into the ditch inlet. However, if diverted water is returned to the stream via the sluice gates, there would be negative impacts to ʻōpae currently living in the ditch system. If the diversion

structures are removed or modified and all flow is retained in the stream, there would be beneficial impacts to other native and invasive stream biota such as bass and habitat downstream of the diversions as all of the water would remain in the stream. There would be no impacts to terrestrial biological resources.

3.6.3 Minimization and Mitigation Measures

The following mitigation measures would be implemented to minimize potential impacts to terrestrial biological resources:

- A botanical monitor would be on-site during any maintenance activities near critical habitat units.
- All equipment and vehicles arriving from outside all portions of the project area located near designated critical habitat would be washed and inspected prior to any maintenance or construction activities to avoid the unintentional introduction or transport of new invasive plant species.
- When possible, raw materials used in maintenance and construction activities would be purchased from a local supplier on the island of Kauaʻi to avoid introducing non-native species not present on the island.
- Regular on-site staff would be trained to identify special status species with the potential to occur within the project area, as well as know the appropriate measures to be taken if a special status species is identified.

The following measures would be implemented to minimize potential impacts to Hawaiian waterbirds and the Hawaiian goose:

- A qualified biological monitor would conduct waterbird nest surveys where suitable habitat occurs near construction areas two weeks prior to construction.
- Subsequent surveys may occur weekly, as needed, if there are delays during the construction phase of the Proposed Action.
- A biological monitor would be on-site during all construction activities.
- Should an active nest be discovered in the project site, the project would be delayed until the chicks have fledged the area.
- Should a listed bird be observed within, or fly into, the project site during construction, activities within 100 feet of the bird would halt until the bird leaves the area.

The following measures would be implemented to minimize potential impacts to Hawaiian seabirds:

- Nighttime construction would be avoided during the seabird fledging season (September 15 to December 15).
- Nighttime construction, if required, between December 16 and September 14 would utilize fully shielded and downward facing construction lights.

The following measures would be implemented to minimize potential impacts to the Hawaiian hoary bat:

- There would be no disturbance, removal, or trimming of woody plants greater than 15-feet-tall during the bat birthing and pup rearing season (June 1 through September 15).

3.7 Cultural Resources

3.7.1 Existing Conditions

A CIA, *Cultural Impact Assessment for Kauaʻi Island Utility Cooperative Blue Hole Diversion Long-Term Lease Project, Wailua and Hanamāʻulu Ahupuaʻa, Līhuʻe District, Kauaʻi,* provided in **Appendix E**, was prepared to consider the Proposed Action's potential effect on cultural beliefs, practices, and resources. The CIA includes a complete literature review of cultural and historic resources, review of previous archaeological work at and near the project area, community consultation, and interviews, and identifies several cultural resources within the vicinity of the Proposed Action.

The following traditional cultural practices were identified within the Wailua and Hanamāʻulu Ahupuaʻa:

- **Political epicenter:** There are many *heiau* located near or at the mouth of the Wailua River (more than seven miles downstream of the project area) that indicate this area was very sacred to the Hawaiian population.
- **Cultivation, fishing, and gathering of plant resources:** There is an abundance of food resources in lower Wailua region. The lower reaches of the Wailua River historically were covered in taro patches and sugar plantations. Patches of breadfruit, sugarcane, and oranges were also observed along the river and stream banks. Current cultural practices include vegetation gathering for cultural practices, including for lei making and ohe hano ihu; traditional subsistence gathering; and fishing.
- **ʻĀina-based learning:** Groups are given access for educational and cultural activities in exchange for restoring native plants, maintenance of ditches or roads, place name and moʻolelo research, or the creation of curriculum about Waiʻaleʻale for island schools.
- **Burials and spirituality:** There are many sacrificial heiau near or at the mouth of the Wailua River, which is more than seven miles downstream of the project area.
- **Trails and Wahi Pana:** There are numerous trails throughout the project vicinity, as well as two swimming holes that were historically and are currently used.

Concerns expressed by the community included the following:

- Low to no flow of water has impacts mauka to makai associated with vegetation and traditional subsistence gathering.
- Water from Waiʻaleʻale is sacred and used for ceremonial purposes. Oli, mele, and hula describe the mass quantity and sacredness of the wai.
- Water rights and DHHL water needs for planning and future beneficiaries.
- Invasive species near river and stream banks, such as *Albizia,* are a threat to native forests by displacing native plants and depleting surrounding, essential resources vital to health and growth.
- Potential impacts to downstream users, including diversified agriculture, if existing ditch systems and reservoirs are not maintained.
- Potential for inadvertent cultural finds, including burials, during construction.

3.7.2 Potential Impacts

Construction

Construction activities at the North Fork Wailua River and Waikoko Stream Diversions would be short-term and temporary. The noise and concentrated human activity in the normally undisturbed area would be disruptive to cultural practitioners utilizing the area, but this would be temporary. Construction activities would be limited to the two diversion locations; therefore, it is expected that construction of the Proposed Action would have less than significant impacts on cultural resources.

Under the No-Action Alternative, no construction activities would occur and there would be no impacts to cultural resources.

Operation

KIUC is currently diverting and using water from the North Fork Wailua River and Waikoko Stream. Operation of the Proposed Action would continue this use. However, water would be retained in the stream to maintain the IFS set by CWRM. As previously stated in **Section 1.7**, the IFS is the "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses" (HAR 174C-3). Therefore, compliance with the IFS would have beneficial impacts to the streams and aquatic resources compared to current conditions, which would have beneficial impacts to cultural practices such as fishing and subsistence gathering.

As discussed in **Section 4.1.4**, KIUC continues to consult with DHHL regarding DHHL development plans in the Wailua watershed and DHHL water needs. DHHL has an approved water reservation from CWRM, and there is no conflict between the DHHL water reservation and long-term water lease. The Proposed Action would have beneficial impacts to DHHL by providing funding via a portion of the water lease rent and by supplementing water available at the Hanamāʻulu Diversion for delivery of water to DHHL lands should they choose to develop.

Operation of the Proposed Action would ensure that KIUC continues to maintain the existing ditch system; therefore, there would be beneficial impacts to downstream users of the water for agriculture.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or continue operation at a reduced capacity without the use of the North Fork Wailua River and Waikoko Stream Diversions. The North Fork Wailua River and Waikoko Stream Diversions and the portion of ditch system on state land would revert to DLNR. In this event it is unclear what would happen to the structures, but they would not be improved by KIUC to maintain the IFS set by CWRM. Without removal of the structures or modifications of the structures, the existing conditions of the stream would remain. The decrease in the amount of water diverted would also have negative effects for downstream agricultural users, including DHHL, and there would be no revenue resource from lease rent available to DHHL. As per the East Kauaʻi Water Users Cooperative in December 2018:

> *"If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question – a key issue of which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the*

Hanamāʻulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process."

3.7.3 Minimization and Mitigation Measures

The following measures would be implemented to minimize potential impacts to cultural resources:

- If human remains or burials are identified, all earth-moving activities in the area would stop, the area would be cordoned off, and SHPD and the Police Department would be notified pursuant to HAR Section 13-300-40.
- If any potential historic properties are identified during construction activities, all activities would cease and SHPD would be notified pursuant to HAR Section 13-280-3.
- Measures to minimize potential impacts to stream habitat and biota and terrestrial biological resources important to cultural practices would be implemented as discussed in **Section 3.5.3** and **Section 3.6.3**.

Additionally, the state is working on balancing the economic needs for the stream waters and the life and health of the stream with ongoing cultural practices including, but not limited to, maintaining traditional ponded fields for taro farming, pig hunting, forest plant collection, and ceremonial use of stream and forest locales. Therefore, operation of the Proposed Action is not expected to have significant impacts to cultural resources.

3.8 Socioeconomic Characteristics

3.8.1 Existing Conditions

Southeast Kauaʻi includes about 37,500 residents in approximately 11,578 households. This population is slightly younger than Kauaʻi County as a whole. The median age of Southeast Kauaʻi residents is 41.6 years, versus the county median of 42.0 years.

Nearly half of Southeast Kauaʻi residents are Asian (49.2%), generally Filipino (59.1% of Asian residents) and Japanese (27.5% of Asian residents). Compared to 11% for the county as a whole, Southeast Kauaʻi has fewer Native Hawaiian residents (10.3%). Approximately 38% of this community's residents are White (37.9% vs 41.7% for the County), and approximately 20% of Southeast Kauaʻi residents have Mixed-Race backgrounds (22.1%; vs 20.0% for the County).

The average household size of 3.24 persons is larger than the county average of 2.88 persons per household. Of the roughly 11,600 occupied housing units in Southeast Kauaʻi, 63.2% are owner-occupied, which is essentially equal to the county average of 63.3%.

KIUC provides electricity to 33,000 electric accounts on the island of Kauaʻi. KIUC is a leader in the use of renewable energy and is committed to using solar, biomass, and hydropower to produce at least 70% of the island's electricity by 2030. KIUC must meet a State of Hawaiʻi mandate of generating 100% of electricity from renewable sources by 2045. Prior to implementing the IFS, KIUC's Upper and Lower Waiahi Hydropower Plants have a combined annual production output of 8,670 MWh at an average low cost of five cents per kWh for an annual operating cost of $438,000. The low annual operation cost translates into savings for KIUC customers that can be used on other commodities while still providing positive inputs to the local economy. Specifically, operation of these facilities results in the creation of an estimated five

person-years of jobs, $200,000 in earnings impacts, $44,500 in State taxes, and $1,200 in County taxes annually.

A Socioeconomic Impact Assessment was conducted for the Proposed Action. This report is provided in **Appendix F**.

3.8.2 Potential Impacts

Construction

Construction of the Proposed Action would result in short-term employment and earnings. The estimated number of total short-term jobs created by the proposed modifications to the diversion facilities is seven person-years of employment, all of which would be retained from the local workforce. Construction payroll is estimated to be $432,900 of which 69% would be retained locally. There would be an estimated contribution of $66,000 in State taxes and $1,800 in County taxes. These estimates are solely for the year 2020. Therefore, there would be a beneficial socioeconomic impact from construction of the Proposed Action.

Under the No-Action Alternative, no construction activities would occur and there would be no socioeconomic benefit.

Operation

Operation of the Proposed Action would provide the following economic benefits:

- An estimated five person-years of jobs
- $200,000 in earnings impact
- $44,500 in State taxes
- $1,200 in County taxes

The proposed modifications to the diversions would generate up to:

- Seven person-years of employment
- $298,700 in earnings impacts
- $66,000 in State taxes
- $1,700 in County taxes

Operation of the Proposed Action would also allow KIUC to continue providing electricity with the lowest cost generation source available. However, with the proposed IFS values of 3.5 mgd at North Fork Wailua River Diversion and 0.8 mgd at Waikoko Stream Diversion, this annual combined production would be reduced by an estimated 29.5% to a post-IFS annual generation of approximately 6,177,990 kWh. This would likely result in an increase in operating cost that would be passed to KIUC customers.

Operation of the Proposed Action also supports the county and state renewable energy goal of 100% renewable energy by 2045. Downstream users of on the Upper Līhuʻe and Hanamāʻulu Ditch systems would still have access to water diverted for use at the hydropower plants. This includes thousands of acres of prime agricultural lands, potable drinking water facilities, public sports and recreation fields and facilities, civic and educational facilities, the Kauaʻi Gateway Project, and DHHL lands. Therefore, operation

of the Proposed Action would have beneficial socioeconomic impacts; however, to maintain the IFS, the amount of water available would be less than what has been historically available.

Under the No-Action Alternative, the Upper and Lower Waiahi Hydropower Plants would either stop operating or continue operation at a reduced capacity. If KIUC stops operating the hydros, this would result in a cost of approximately $1.75 Million annually to produce the same amount of power with diesel. There would also be an added cost in terms of jobs and operations amounts estimated at 16 person-years of jobs, more than $220,500 in earnings, $117,900 in State taxes, and more than $3,000 in County taxes in 2020 alone.

Other economic impacts associated with the No-Action Alternative include the reduction of water available for downstream uses. As per the East Kauaʻi Water Users Cooperative in December 2018:

> *"If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question – a key issue of which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamāʻulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process."*

In addition to impacts to ADC and DHHL lands, there would be impacts to Grove Farm agricultural tenants, the Waiahi Water Company, Kauaʻi Backcountry Adventures, and government facilities under the No-Action Alternative.

3.8.3 Minimization and Mitigation Measures

No minimization or mitigation measures are proposed or expected to be required.

3.9 Recreation and Visual Resources

3.9.1 Existing Conditions

The North Fork Wailua River and Waikoko Stream Diversions are located in the Līhuʻe-Kōloa Forest Reserve, which is managed by DOFAW. The Līhuʻe-Kōloa Forest Reserve was established in 1909 for the purpose of protecting watershed areas vital to the lowland agricultural economy. It consists of over 12,500 acres of public land. Recreational uses in the Līhuʻe-Kōloa Forest Reserve include hiking, picnics, fishing, hunting, horseback riding, riding dirt bikes or mountain bikes, and plant collecting. Camping is not allowed. Details regarding these activities and any restrictions are provided in **Table 32**.

The North Fork Wailua River Diversion is located in an area known widely as Blue Hole, which has long been a destination for hiking, swimming, hunting, ditch tubing, and family picnics. The North Fork Wailua River and Waikoko Stream Diversions, as well as the ʻIliʻiliʻula North Wailua Ditch, have played an integral role in this area being accessible and available for continued recreational uses. The main access road, known as the Wailua Forest Management Road or Loop Road, and many of the trails in the area were originally constructed during the plantation era and provided access for ditch construction and maintenance. The Waikoko ditch trail is widely used, as is the stream crossing at the North Fork Wailua River Diversion to access the trail to the headwall at Blue Hole.

Families frequent the swimming pools created by the North Fork Wailua River and Waikoko Stream Diversions throughout late spring, summer, and early fall. It is also very common for families to picnic on the concrete spillways near the water's edge. Tubing in the section of ditch between the North Fork Wailua River and Waikoko Stream Diversions is a very popular activity. In fact, swimming in diversion pools and ditch tubing are so popular that when KIUC is not diverting, people sometimes use rocks or other natural materials to block the sluice gate where water is released during hydropower plant shutdowns to force water back into the ditch for tubing. The ditch maintenance crew has occasionally cleared rock dams at the spillway and ditch inlet, which were placed by members of the public to increase the diversion pool depth for swimming.

Table 32. Recreational Activities Allowed in the Līhuʻe-Kōloa Forest Reserve

Activity	Description and Restrictions
Hiking	Na Ala Hele, the State of Hawaiʻi Trail and Access Program, manages three trails at the Līhuʻe-Kōloa Forest Reserve: • Powerline Trail: follows 13 mile electric transmission line maintenance route along the eastern edge of Haleleʻa Forest Reserve ending at the Keāhua Forestry Arboretum in the Līhuʻe-Kōloa Forest Reserve. This trail is not maintained and there are no amenities. • Kuilau Trail: starts on Highway 580 approximately 100 yards before the Keahua Arboretum and travels approximately 1.75 miles to meet with the Moalepe Trail, which continues into the Kealia Forest Reserve. This trail features bridges, parking, shelters, and tables. • Wailua Forest Management Road: starts at the Keāhua Arboretum and ends at the gate leading to Blue Hole. The road crosses the North Fork of the Wailua River and continues past Hanahanapuni. Non-hunters are advised to wear bright colors. There are no amenities.
Picnics	There are six open shelters with picnic tables available for day use only. Four are located at the Keāhua Arboretum, one is along the Kuilau Trail, and one is near the North Fork of the Wailua River.
Fishing	Opportunities exist to fish for small mouth bass in the Wailua section of the Forest Reserve.
Hunting	Game hunting for feral pigs and feral goats is allowed throughout the Forest Reserve. Hunting is restricted to weekends, Mondays, and State holidays.
Horseback Riding	Horseback riding is allowed on the Powerline Trail and the Kuilau Trail. Parking for trailers and a "horse parking" area is available at the Keāhua Arboretum.
Dirt Biking	Dirt bikes are allowed on the Powerline Trail and the Wailua Forestry Road. Dirt bikes must be registered by the County Division of Motor Vehicles.
Mountain Biking	Mountain bikes are allowed on all trails in the Forest Reserve.
Plant Collecting	Non-timber forest products may be collected in the Forest Reserve. This includes ferns, flowers, fruits, guava poles, maile, mokihana, and bamboo.

The concrete spillway structure at the North Fork Wailua River Diversion provides a safe and reliable crossing except during extreme high stream flow events for hunters and hikers. It is the only defined crossing of the North Fork Wailua River in the upper elevation area. The Blue Hole headwall is approximately 1.5 miles upstream of the North Fork Wailua River Diversion, and the trail to the headwall weaves through dense vegetation and forest.

Future modifications to the North Fork Wailua River and Waikoko Stream Diversion structures to meet the IFS, maintenance of these structures, and access into Līhuʻe-Kōloa Forest Reserve to operate and maintain these structures would be addressed in the terms of the long-term water lease.

3.9.2 Potential Impacts

Construction

Construction of the Proposed Action would restrict access at the North Fork Wailua River and Waikoko Stream Diversions during the construction period. Access would also be limited on the trails between the diversions. Construction would be short-term and temporary and is not expected to be significant. The construction associated with the Proposed Action would repair deteriorated concrete and rebar present at the legacy diversion structures and as a result would improve public safety at the diversion sites.

Under the No-Action Alternative, no construction activities would occur and there would be no repairs. Degradation of the deteriorated concrete and exposed rebar would continue at both sites creating a negative impact to public safety in the vicinity of the diversions.

Operation

As discussed in **Section 2.1.2**, the Proposed Action includes repairing damage to both structures due to vandalism and general degradation over time and during high flow events. Operation of the Proposed Action would reduce the existing amount of water diverted from the North Fork Wailua River and Waikoko Stream Diversions in order to maintain the IFS. Therefore, upon completion of construction there would be beneficial impacts to recreation from providing a safer and more enjoyable resource at the diversion locations.

Under the No-Action Alternative, both structures would continue to degrade resulting in a decrease of public safety at both sites.

3.9.3 Minimization and Mitigation Measures

No minimization or mitigation measures are proposed.

3.10 Secondary Impacts and Cumulative Effects

Secondary impacts are those effects that are caused by an action and are later in time or farther removed in distance but are reasonably foreseeable. They may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water or other natural systems. The Proposed Action would not involve a change in land use and would not induce growth. Therefore, the Proposed Action would not have secondary impacts.

Cumulative effects refer to the impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant impacts taking place over time. The Proposed Action involves the continued operation of two existing hydropower plants through a 65-year lease to divert water at the North Fork Wailua River and Waikoko Stream Diversions. There would be no cumulative impacts from continued operation of the facilities. All potential impacts from construction of modifications at the diversions would

be short-term and temporary during construction and would be minimized through the implementation of appropriate BMPs. Therefore, construction of the Proposed Action would not result in negative cumulative impacts. Operation of the Proposed Action could result in beneficial cumulative impacts from improved air quality associated with the reduction of the use of fossil fuels and increased stream health from compliance with the IFS.

3.11 Irretrievable and Irreversible Commitment of Resources

The Proposed Action includes a long-term water lease to divert water for continued operation of two existing hydropower plants. All water diverted is released back into the stream system. Implementation of the Proposed Action would not result in the irretrievable and irreversible commitment of resources other than the financial resources, fuel, and other consumable materials required for construction.

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4 RELATIONSHIP TO STATE AND COUNTY LAND USE PLANS AND POLICIES

4.1 State Planning Documents

4.1.1 The Hawaiʻi State Plan

The Hawaiʻi State Plan, codified as HRS Chapter 226, provides goals, objectives, policies, and priorities for the State. The Hawaiʻi State Plan also provides a basis for determining priorities, allocating limited resource, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. It establishes a set of themes, goals, objectives, and policies that are meant to guide the State's long-range growth and development activities. The Proposed Action is consistent with the following applicable objectives and policies:

Section 226-7. *Objectives and policies for the economy – agriculture.*

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:
(2) Continued growth and development of diversified agriculture throughout the State.
(b) To achieve the agricultural objectives, it shall be the policy of this State to:

(6) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

Discussion: The Proposed Action is located in the Wailua River watershed and would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions for use in the Upper and Lower Waiahi Hydropower Plants. Water is then released to Waiahi Stream, a tributary to the South Fork Wailua River, where it is made available for other users. This includes thousands of acres of prime agricultural lands. Therefore, the Proposed Action is consistent with the objectives and policies for agriculture.

Section 226-11. *Objectives and policies for the physical environment – land-based, shoreline, and marine resources.*

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
(1) Prudent use of Hawaiʻi's land-based, shoreline, and marine resources.
(2) Effective protection of Hawaiʻi's unique and fragile environmental resources.
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
(1) Exercise an overall conservation ethic in the use of Hawaiʻi's natural resources.
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.

(8) Pursue compatible relationships among activities, facilities, and natural resources.

Discussion: The Proposed Action is located in the Wailua River watershed and would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions. As part of the Proposed Action, improvements would be made to the diversions to ensure that the appropriate IFS is maintained in the streams, thereby improving downstream conditions. All of the water used to power the Upper and Lower Waiahi Hydropower Plants is released into Waiahi Stream and is available for other users. In addition, no additives are used and there is no change to water quality or temperature. Therefore, the Proposed Action is consistent with the objectives and policies for land-based, shoreline, and marine resources.

Section 226-12. *Objectives and policies for the physical environment – scenic, natural beauty, and historic resources.*

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaiʻi's scenic assets, natural beauty, and multi-cultural/historical resources.

(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:

(1) Promote the preservation and restoration of significant natural and historic resources.

(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaiʻi's ethnic and cultural heritage.

Discussion: The Proposed Action would allow for the continued use of two existing hydropower plants. Neither of these plants are visible from any scenic area. Additionally, neither of the plants are considered an integral and functional part of Hawaiʻi's ethnic and cultural heritage. Therefore, the Proposed Action is consistent with the objectives and policies for scenic, natural beauty, and historic resources.

Section 226-13. *Objectives and policies for the physical environment – land, air, and water quality.*

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

(1) Maintenance and pursuit of improved quality in Hawaiʻi's land, air, and water resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaiʻi's people.

(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaiʻi's people, their cultures and visitors.

Discussion: The Proposed Action would allow for the continued operation of the Upper and Lower Waiahi Hydropower Plants. Hydropower can have a beneficial effect on air quality by reducing fossil-fueled energy generation and the associated air emissions. Hydroelectric power production does not create noxious emissions. The estimated future production of the Upper and Lower Waiahi Hydropower Plants prior to consideration of the CWRM staff recommended interim IFS is 8,760 MWh annual combined output, which equates to approximately 675,000 gallons of diesel per year displaced by renewable energy.

With the proposed IFS values of 3.5 mgd at the North Fork Wailua River Diversion and 0.8 mgd at the Waikoko Stream Diversion, this annual combined production would be reduced by an estimated 29.5% to a post-IFS annual generation of approximately 6,177,990 kWh. By displacing fossil fuel power generation, the Upper and Lower Waiahi Hydropower Plants have a beneficial impact on air quality in Hawaiʻi. Those beneficial impacts are increased when production of the hydropower plants is increased.

Operation of the hydroelectric facilities would not cause water pollution as no foreign objects or chemicals are introduced to the water during its passage through the penstock or turbine. Additionally, there is no heat removal or addition to the water as it passes through the plant. Therefore, the Proposed Action is consistent with the objectives and policies for land, air, and water quality.

Section 226-14. *Objectives and policies for facility systems – in general.*

- *(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.*
- *(b) To achieve the general facility systems objective, it shall be the policy of this State to:*
  - *(2) Encourage flexibility in design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.*
  - *(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.*

Discussion: The Proposed Action would allow for the continued operation of two hydropower plants. KIUC would make permanent modifications to the diversion structures to ensure the CWRM staff recommended interim IFS or any future IFS established by CWRM remains in the stream channel at all times (i.e., "promote prudent use of resources"). Operation of the Proposed Action would also allow KIUC to continue providing electricity with the lowest cost generation source. Therefore, the Proposed Action is consistent with the objectives and policies for facility systems in general.

Section 226-16. *Objective and policies for facility systems – water.*

- *(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.*
- *(b) To achieve the facility systems water objective, it shall be the policy of this State to:*
  - *(1) Coordinate development of land use activities with existing and potential water supply.*

Discussion: The Proposed Action is located in the Wailua River watershed and would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions for use in the Upper and Lower Waiahi Hydropower Plants. Water is then released to Waiahi Stream, a tributary to the South Fork Wailua River, where it is made available for other users. This includes thousands of acres of prime agricultural lands, potable drinking water facilities, public sports and recreation fields and facilities, civic and educational facilities, the Kauaʻi Gateway Project, and DHHL lands. Therefore, the Proposed Action is consistent with the objective and policies for water facility systems.

Section 226-18. *Objectives and policies for facility systems – energy.*

(a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:
(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;
(2) Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawaiʻi's dependence on imported fossil fuels for electrical generation and ground transportation;
(3) Greater diversification of energy generation in the face of threats to Hawaiʻi's energy supplies and systems;
(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and
(5) Utility models that make the social and financial interests of Hawaiʻi's utility customers a priority.
(b) To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably priced, and dependable energy services to accommodate demand.
(c) To further achieve the energy objectives, it shall be the policy of this State to:
(1) Support research and development as well as promote the use of renewable energy sources.
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications.

Discussion: The Proposed Action includes the continued operation of two hydropower projects: the Upper and Lower Waiahi Hydropower Plants. As a renewable energy project, the Proposed Action reduces imports of oil for conventional diesel electric power generation. The continued operation of these hydropower plants would further help to achieve the State of Hawaiʻi's goal of 100% renewable energy by 2045.

Section 226-19. *Objectives and policies for socio-cultural advancement – housing.*

(a) Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:
(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low-, and moderate-income segments of Hawaii's population.
(2) The orderly development of residential areas sensitive to community needs and other land uses.
(b) To achive the housing objectives, it shall be the policy of this State to:
(5) Promote design and location of housing developments taking into account the physical setting, accessibility, public facilities and services, and other concerns of existing communities and surrounding areas.

Discussion: The Proposed Action would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions for use at the Upper and Lower Waiahi Hydropower Plants. The diverted water is subsequently released from the Lower Waiahi Hydropower Plant tailrace into Waiahi Stream, thereby increasing the water volume available in the stream for water use needs on the Upper Līhuʻe and Hanamāʻulu Ditches, thus benefitting downstream water users. This includes the existing water treatment plant that provides drinking water to the County of Kauaʻi and the potential for future drinking water needs that will be necessary for future housing development in Līhuʻe. Therefore, the Proposed Action is consistent with the objectives and policies for water.

Section 226-23. *Objective and policies for socio-cultural advancement – leisure.*

(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.

(b) To achieve the leisure objective, it shall be the policy of this State to:

(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

Discussion: The Proposed Action includes repairing damage to the North Fork Wailua River and Waikoko Stream Diversions (collectively referred to as Blue Hole) due to vandalism and general degradation over time and during high flow events. Operation of the Proposed Action would reduce the existing amount of water diverted from the North Fork Wailua River and Waikoko Stream Diversions to maintain the IFS. Therefore, upon completion of construction, there would be beneficial impacts to recreation from providing a safer and more enjoyable resource at the diversion locations. The Proposed Action would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions and release it to Waiahi Stream, a tributary to the South Fork Wailua River, where it is made available for other users. This includes public sports and recreation fields and facilities, including Kauaʻi Backcountry Adventures. Therefore, the Proposed Action is consistent with the objective and policies for leisure.

Section 226-103(f). *Economic priority guidelines – energy use and development.*

Priority guidelines for energy use and development:

(1) Encourage the development, demonstration, and commercialization of renewable energy sources.

Discussion: The Proposed Action would allow for the continued operation of the Upper and Lower Waiahi Hydropower Plants. Therefore, the Proposed Action is consistent with the priority guidelines for energy use and development.

Section 226-108. *Sustainability.*

Priority guidelines and principles to promote sustainability shall include:

(1) Encouraging balanced economic, social, community, and environmental priorities.

(2) Encourage planning that respects and promotes living within the natural resources and limits of the State

(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations

Discussion: The Proposed Action would allow for the continued operation of the Upper and Lower Waiahi Hydropower Plants. KIUC would make permanent modifications to the diversion structures to ensure the CWRM staff recommended interim IFS or any future IFS established by CWRM remains in the stream channel at all times (i.e., "promotes living within the natural resources limits of the State"). Operation of the Proposed Action would also allow KIUC to continue providing electricity with the lowest cost generation source available. KIUC would implement measures during construction and operation to minimize impacts on economic, social, and environmental resources. Therefore, the Proposed Action is consistent with the objectives and policies for facility systems in general.

Section 226-109. *Climate change adaptation priority guidelines.*

Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall:

(1) Ensure that Hawaiʻi's people are educated, informed, and aware of the impacts climate change may have on their communities;

(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;

(3) Invest in continued monitoring and research of Hawaiʻi's climate and the impacts of climate change on the State;

(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;

(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;

(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;

(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options;

(8) Foster cross-jurisdictional collaboration between County, State, and Federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities;

(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and

(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.

Discussion: The purpose of the Proposed Action is to continue to operate the two hydropower projects: the Upper and Lower Waiahi Hydropower Plants. Renewable energy generated by hydropower projects reduces imports of oil for conventional diesel electric power generation and reduces greenhouse gas emissions. The continued operation of these hydropower plants would further help to achieve the State of Hawaiʻi's goal of 100% renewable energy by 2045.

The following themes of Part I of the Hawaiʻi State Plan are not applicable to the Proposed Action for the following reasons:

- ***Section 226-5.*** *Objective and policies for population:* The Proposed Action would not result in population growth.
- ***Section 226-6.*** *Objectives and policies for the economy – in general:* The Proposed Action would not result in increased and diversified employment opportunities other than the temporary construction jobs.
- ***Section 226-8.*** *Objective and policies for the economy – visitor industry:* The Proposed Action does not involve the visitor industry.
- ***Section 226-9.*** *Objective and policies for the economy – federal expenditures:* The Proposed Action does not include the use of federal funds.
- ***Section 226-10.*** *Objective and policies for the economy – potential growth and innovative activities:* The Proposed Action does not include opportunities for investment or employment growth.
- ***Section 226-10.5.*** *Objective and policies for the economy – information industry:* The Proposed Action does not include nor impact telecommunications or information technology resources.
- ***Section 226-15.*** *Objective and policies for facility systems – solid and liquid wastes.* The Proposed Action does not include development of solid or liquid waste facilities.
- ***Section 226-17.*** *Objectives and policies for facility systems – transportation.* The Proposed Action does not include new transportation facilities.
- ***Section 226-18.5.*** *Objective and policies for facility systems – telecommunications.* The Proposed Action does not include new telecommunication facilities.
- ***Section 226-20.*** *Objectives and policies for socio-cultural advancement – health.* The Proposed Action does not include health facilities or services.
- ***Section 226-21.*** *Objectives and policies for socio-cultural advancement – education.* The Proposed Action does not include educational programs or facilities.
- ***Section 226-22.*** *Objectives and policies for socio-cultural advancement – social services.* The Proposed Action does not include social services or activities.
- ***Section 226-24.*** *Objectives and policies for socio-cultural advancement – individual rights and personal well-being.* The Proposed Action would have no impact to personal rights and personal well-being.

- ***Section 226-25.*** *Objectives and policies for socio-cultural advancement – culture.* The Proposed Action would have no impacts to cultural identities, traditions, values, customs, and arts of Hawaiʻi's people.
- ***Section 226-26.*** *Objectives and policies for socio-cultural advancement – public safety.* The Proposed Action would have no impact on public safety programs.
- ***Section 226-27.*** *Objectives and policies for sociocultural advancement – government.* The Proposed Action would have no impact on government services.

The themes of Part II of the Hawaiʻi State Plan are not applicable to the Proposed Action since the Proposed Action does not involve the preparation of planning documents.

The following themes of Part III of the Hawaiʻi State Plan are not applicable to the Proposed Action for the following reasons:

- ***Section 226-104.*** *Population growth and land resources priority guidelines.* The Proposed Action would not result in population growth nor any change in land use.
- ***Section 226-105.*** *Crime and criminal justice.* The Proposed Action does not involve the criminal justice system.
- ***Section 226-106.*** *Affordable housing.* The Proposed Action would not provide housing.
- ***Section 226-107.*** *Quality education.* The Proposed Action would have no impact on education opportunities or facilities.

4.1.2 State Land Use Law

Hawaiʻi was the first of the fifty States to have a State Land Use Law and a State Plan. Today, Hawaiʻi remains unique among the fifty states with respect to the extent of control that the state exercises in land use regulation. The state has four classifications: Agricultural, Conservation, Rural, and Urban. The State Land Use Law HRS, Chapter 205 initially set the boundaries for the four classifications: Urban, Agricultural, Conservation, and Rural.

Discussion: As shown in **Figure 39**, the Proposed Action is located in an area designated Conservation. Permitted uses within the Conservation District are dependent on the designated subzone. As shown in **Figure 40**, all of the facilities associated with the Proposed Action are located within the Resource subzone of the Conservation District.

The objective of the Resource subzone is "to ensure, with proper management, the sustainable use of the natural resources of those areas." Power generation from renewable resources, including hydropower, is a permissible use in the Resource subzone of the Conservation District. Therefore, the Proposed Action is consistent with the State Land Use Law.

Figure 39. State Land Use Districts

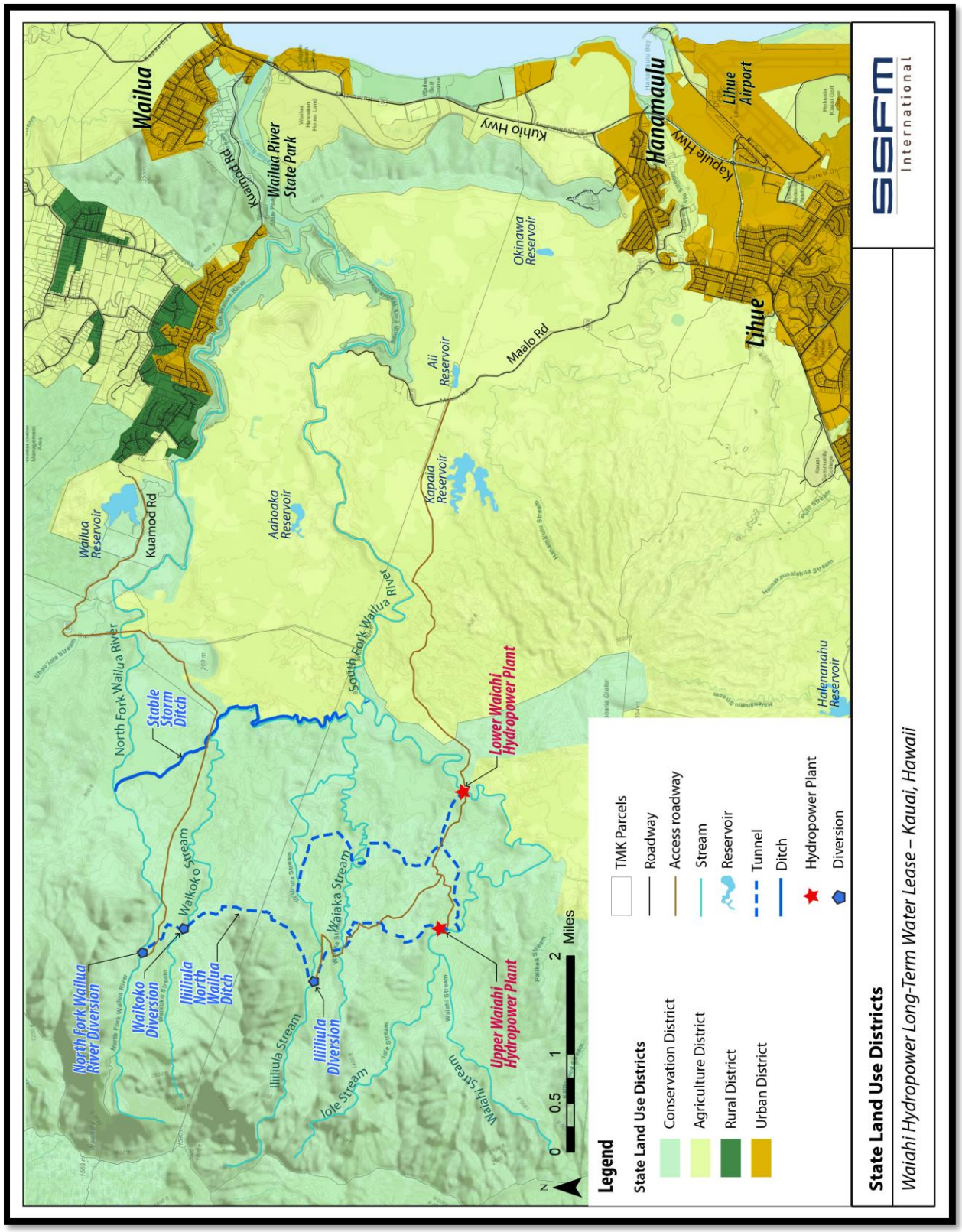
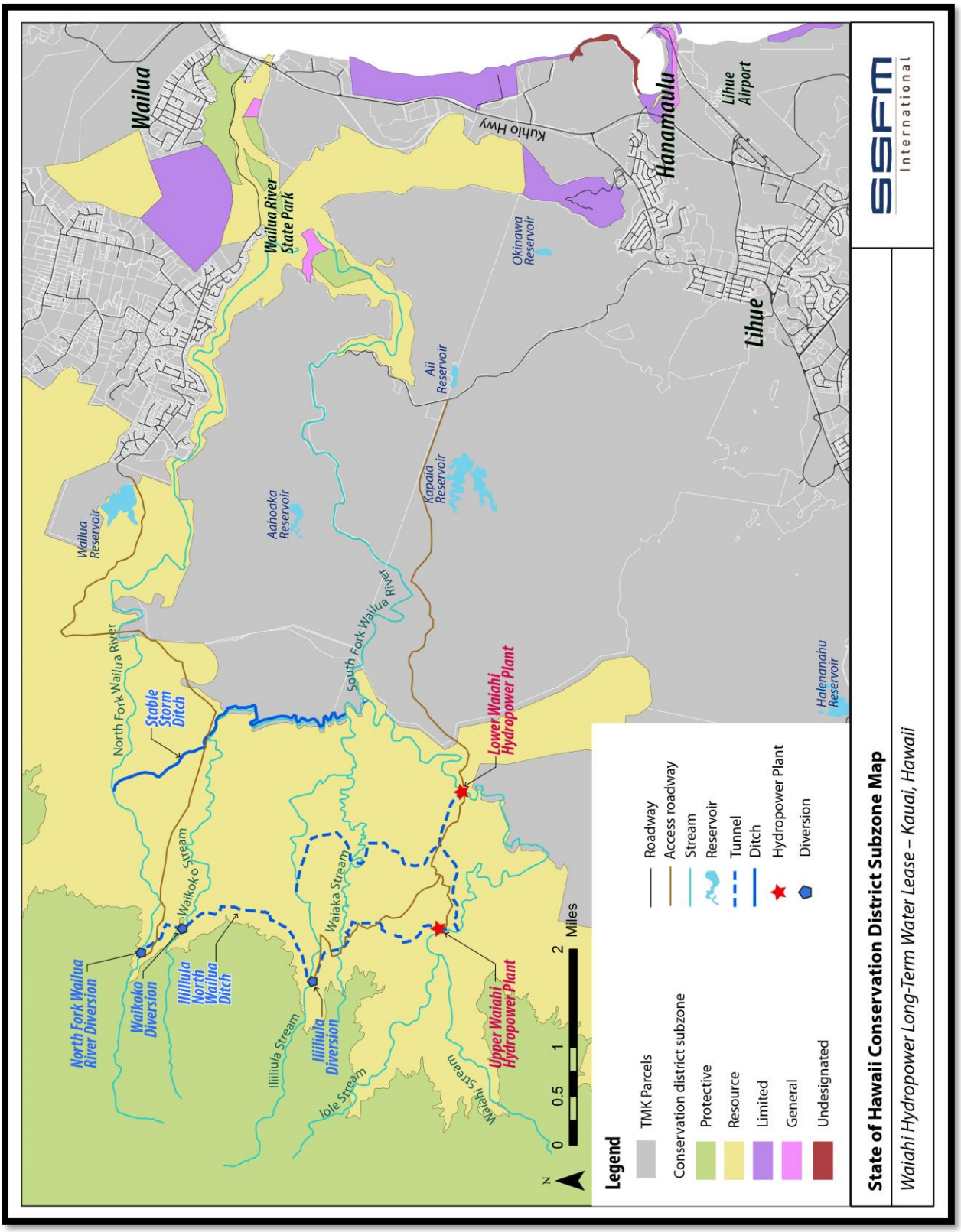


Figure 40. Conservation District Subzones



4.1.3 Hawaii Coastal Zone Management Program

The National Coastal Zone Management (CZM) Program was created with the passage of the Coastal Zone Management Act of 1972 (CZMA). Hawaiʻi's CZM Program, established pursuant to HRS Chapter 205A, as amended, is administered by the State of Hawaiʻi Office of Planning and provides for the beneficial use, protection, and development in the State's coastal zone. The objectives and policies of the Hawaiʻi CZM Program encompass a wide array of concerns including impacts to recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The Hawaiʻi CZM area includes all lands within the State and the areas seaward to the extent of the State's management jurisdiction. Therefore, the proposed project site is located within the CZM area.

The Proposed Action is consistent with the following objectives and policies of the Hawaiʻi CZM Program:

(1) Recreational resources

OBJECTIVE:

Provide coastal recreational opportunities accessible to the public.

POLICIES:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

ii. Requiring replacement of coastal resources having significant recreational value, including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

iv. Providing an adequate supply of shoreline parks and other recreational facilities for public recreation;

v. Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

vi. Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

vii. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

viii. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

Discussion: The Proposed Action is not in a coastal area and would have no impacts to coastal recreational opportunities.

(2) Historic resources

OBJECTIVE:

Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

POLICIES:

(A) Identify and analyze significant archaeological resources;
(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and
(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The Proposed Action includes modifications to the diversion structures to retain water in the stream to maintain the IFS set by CWRM. Compliance with the IFS would have beneficial impacts to the streams and aquatic resources compared to current conditions, which would have beneficial impacts to cultural practices such as fishing and subsistence gathering.

(3) Scenic and open space resources

OBJECTIVE:

Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

POLICIES:

(A) Identify valued scenic resources in the coastal zone management area;
(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.
(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The Proposed Action includes repairing damage to the North Fork Wailua River and Waikoko Stream Diversions (collectively referred to as Blue Hole) due to vandalism and general degradation over time and during high flow events. Operation of the Proposed Action would reduce the existing amount of water diverted from the North Fork Wailua River and Waikoko Stream Diversions to maintain the IFS. Therefore, upon completion of construction there would be beneficial impacts to recreation from providing a safer and more enjoyable resource at the diversion locations. The Proposed Action would continue to divert water from the North Fork Wailua River and Waikoko Stream Diversions and release it to Waiahi Stream, a tributary to the South Fork Wailua River, where it is made available for other users. This includes public sports and recreation fields and facilities, including Kauaʻi Backcountry Adventures.

(4) Coastal Ecosystems

OBJECTIVE:

Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

POLICIES:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
(B) Improve the technical basis for natural resource management;
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The Proposed Action is not in a coastal area and would have no impacts to coastal ecosystems.

(5) Economic Uses

OBJECTIVE:

(A) Provide public or private facilities improvements important to the State's economy in suitable locations.

POLICIES:

(A) Concentrate coastal dependent development in appropriate areas;
(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
    i. Use of presently designated locations is not feasible;
    ii. Adverse environmental effects are minimized; and
    iii. The development is important to the State's economy.

Discussion: The Proposed Action is not in a coastal area and does not involve the construction of new facilities.

(6) Coastal hazards

OBJECTIVE:

(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

POLICIES:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;
(C) *Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*
(D) *Prevent coastal flooding from inland projects.*

Discussion: The Proposed Action is not in a coastal area and would have no impact to or from coastal hazards.

(7) Managing development

OBJECTIVE:

(A) Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

POLICIES:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and
(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The Draft EA is being provided for public comment and review. To facilitate the agency review process for the required permits for the Proposed Action, KIUC will meet with the various agencies prior to submitting permit application packages. The permit review process will provide additional opportunities for public involvement.

(8) Public Participation

OBJECTIVE:

(A) Stimulate public awareness, education, and participation in coastal management.

POLICIES:

(A) Promote public involvement in coastal zone management processes;
(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and
(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: Opportunities for public awareness, education, and participation in coastal management are provided through Federal, State, and County regulatory review process. The Draft EA is being provided for public comment and review. Additional opportunities for review will come during the entitlement process.

(9) Beach protection

OBJECTIVE:

Protect beaches for public use and recreation.

POLICIES:

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The Proposed Action is not in a coastal area and would have no impacts to beaches.

(10)Marine resources

OBJECTIVE:

Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

POLICIES:

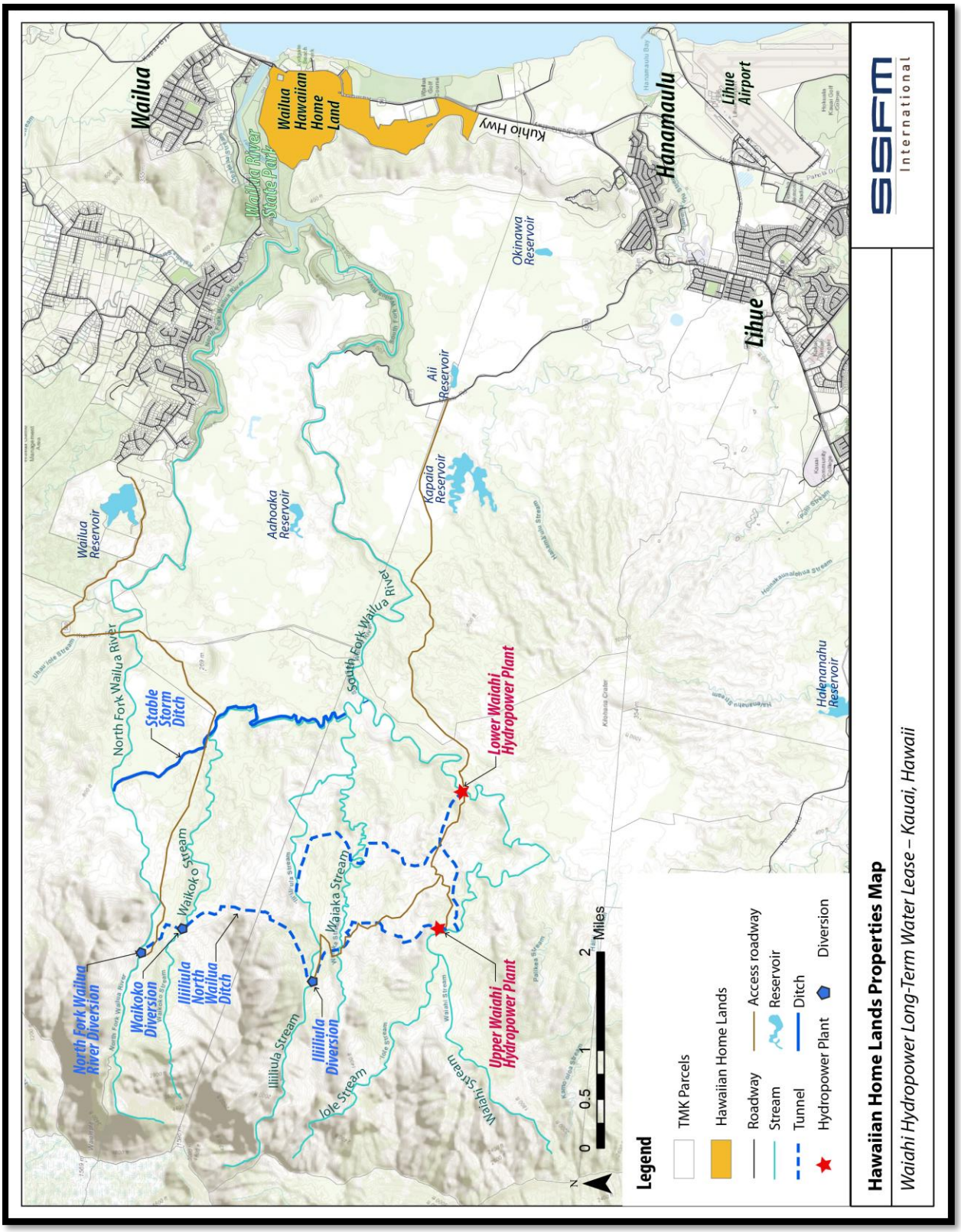
(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.

Discussion: The Proposed Action is not in a coastal area and would have no impacts to marine resources.

4.1.4 Department of Hawaiian Home Lands Wailua Regional Plan

DHHL owns and manages a segment of land makai of Kālepa Ridge and adjacent to the mouth of the Wailua River as shown in **Figure 41**. Development plans for these lands are outlined in DHHL's *Wailua Regional Plan* (December 2009) as the first priority project of the *Kauaʻi Island Plan*, which was updated in June 2004. The plans for the Wailua lands include 640 residential lots at 10,000 sq. ft. (216 acres), 47 acres of commercial lands, 20 acres of community use lands, 92 acres of Special District lands, 25 agricultural homestead lots at 2 acres each, and 52 acres of General Agricultural lands.

Figure 41. DHHL Land Ownership



On September 18, 2018, CWRM approved a DHHL water reservation for ground water from the Wailua Aquifer System Area of 0.78 mgd. On October 16, 2018, CWRM approved DHHL's request for a water reservation of 0.513 mgd of surface water from the Wailua River, Wailua Surface Water Hydrologic Unit. Water uses on these lands were historically served by the Hanamāʻulu Diversion and Ditch via a tunnel extending from Reservoir 21 through Kālepa Ridge. It is unclear at this time how and where DHHL may decide to withdraw the 0.513 mgd of surface water: from the South Fork at the Hanamāʻulu Diversion, from the mainstem of the Wailua River closer to their lands, or from a separate intake structure at some other point. However, continued operation of the North Fork Wailua River and Waikoko Stream Diversions would not negatively impact DHHL's water reservation and may have a beneficial impact by contributing supplemental flows during the drier season from the North Fork Wailua River to the South Fork Wailua River, which would increase the amount of water available in the South Fork basin for water needs. In addition, there would be a beneficial impact to DHHL in the form of a portion of the water lease rent that would go to DHHL.

KIUC consulted with DHHL on multiple occasions in 2018 regarding DHHL development plans in the Wailua watershed and DHHL water needs as listed below:

1. January 9, 2018 meeting at the DHHL office in Kapolei
2. March 12, 2018 site visit with DHHL staff to North Fork Wailua River and Waikoko Stream Diversions and the Upper and Lower Waiahi Hydropower Plants
3. August 20, 2018 site visit with DHHL staff to North Fork Wailua River and Waikoko Stream Diversions and the Upper and Lower Waiahi Hydropower Plants

KIUC will continue to consult with DHHL as they determine the best location for accessing the surface water reservation approved by CWRM.

4.1.5 Līhuʻe-Kōloa Forest Reserve Management Plan

The *Līhuʻe-Kōloa Forest Reserve Management Plan* identifies the management priorities for the forest reserve. There are eight management priorities that are ranked as follows:

1. Watershed values
2. Additional public activity
3. Native ecosystems
4. Invasive species control
5. Game animal management
6. Commercial activity
7. Resource protection
8. Threatened and endangered species management

The general management action and an assessment of the Proposed Action's consistency with these management priorities are provided in **Table 33**.

Table 33. Līhuʻe-Kōloa Forest Reserve Management Priorities

Management Priority	General Management Action	Consistency
Watershed Values	Reduce the threat and impact of erosion on reserve resources	BMPs would be implemented during construction to minimize potential impacts to water resources.
Additional Public Activity	Provide high quality recreational opportunities	The Proposed Action includes repairing damage to both structures due to vandalism and general degradation over time and during high flow events. Upon completion of construction there would be beneficial impacts to recreation from providing a safer and more enjoyable resource at the diversion locations.
Native Ecosystems	Protect V-1 and V-2 areas as defined by DOFAW's draft management guidelines	BMPs and other mitigation measures would be implemented during construction to minimize impacts to natural resources.
Invasive Species Control	Reduce/prevent invasive species from entering V-1 and V-2 areas	Mitigation measures would be implemented during construction to prevent the spread and introduction of non-native species.
Game Animal Management	Continue to provide public hunting opportunities	The Proposed Action would continue to provide the benefit for hunting opportunities through hunter's use of the North Fork Wailua River Diversion as a point of safe stream crossing.
Commercial Activity	Promote ecotourism and manage forest/timber resources	The Proposed Action would divert water at a reduced rate than current operations. Water released at the Lower Waiahi Hydropower Plant tailrace supplements the natural stream flow. The combination of this water is diverted into Hanamāʻulu and used by Kauaʻi Backcountry Adventures. The Proposed Action would not have any impact on new commercial activity in the forest reserve.
Resource Protection	Reduce the threat of fire, insects, and disease	BMPs and other mitigation measures would be implemented during construction to minimize impacts to natural and social resources.
Threatened and Endangered Species Protection	Protect occurrences of listed rare plants and animals	Mitigation measures would be implemented to minimize potential impacts to special status species.

4.2 County of Kauaʻi Planning Documents

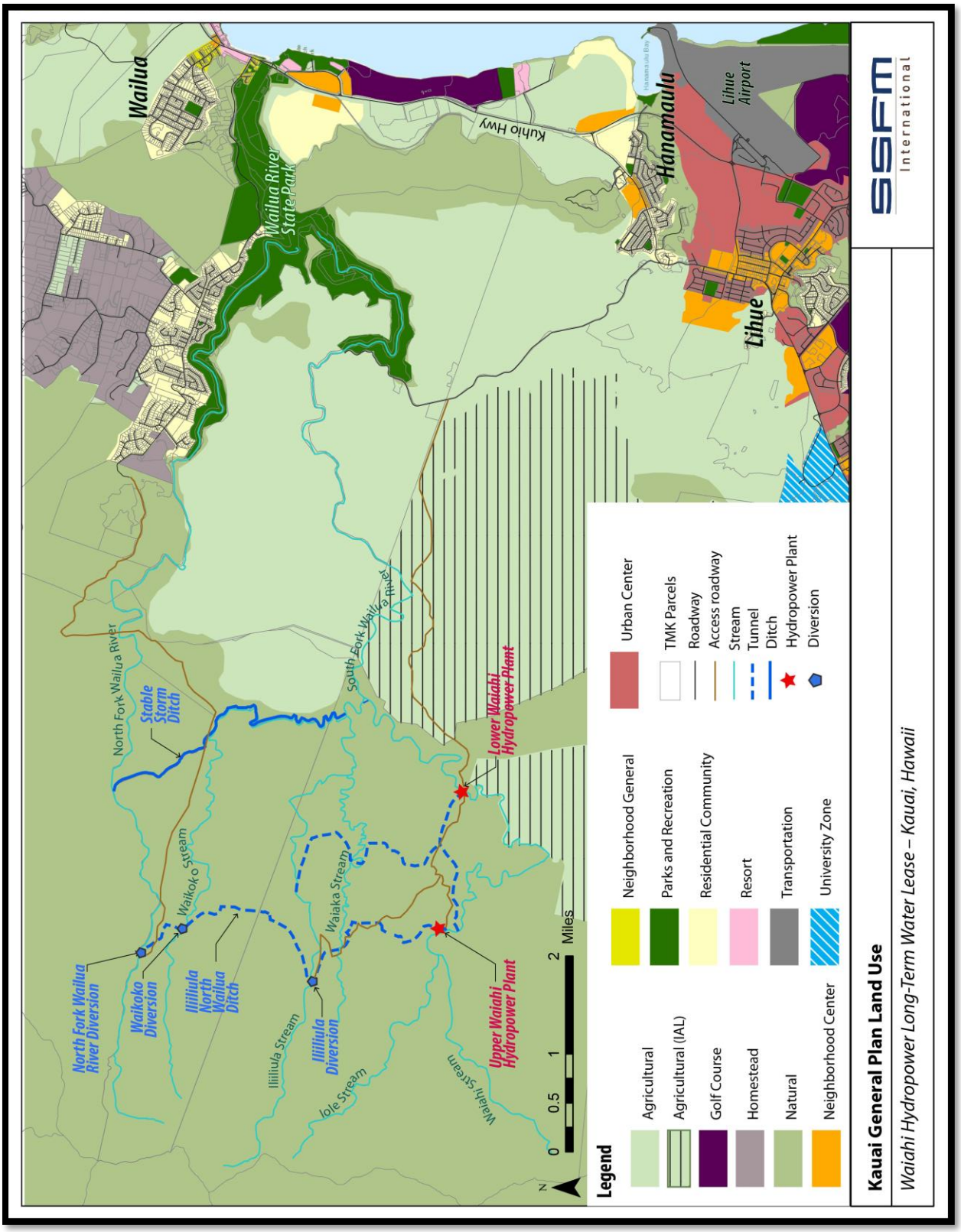
4.2.1 County of Kauaʻi General Plan

The *County of Kauaʻi General Plan* provides guidance for land use regulations, the location and character of new development and facilities, and planning for County and State facilities and services. As shown in **Figure 42**, the Proposed Action is located in the "Natural" land use designation. Areas designated as "Natural" have either limited development capacity or are not suitable for development due to various reasons. Goals for the Natural designation and an assessment of the Proposed Action's consistency with these goals is provided in **Table 34**.

Table 34. Kauaʻi General Plan Land Use Goals

Sector	Goal	Consistency
Watershed	Ensure use and enjoyment of resources without depletion	BMPs and other mitigation measures would be implemented during construction to minimize impacts to natural resources and cultural resources.
	Protect natural, historic, and cultural resources in perpetuity	
	Protect resources and traditions that promote self-sufficiency	
	Promote equal access to natural areas and recreation	
Shared Spaces	Provide adequate park facilities for resident and visitor enjoyment	The Proposed Action includes repairing damage to both structures due to vandalism and general degradation over time and during high flow events. Upon completion of construction there would be beneficial impacts to recreation from providing a safer and more enjoyable resource at the diversion locations. In addition, downstream users such as Kauaʻi Backcountry Adventures would be positively impacted by the Proposed Action.
	Protect popular destinations from deterioration and overuse	
	Provide a diversity of facilities that support active lifestyles	
	Increase access to parks and recreation in all neighborhoods	
Heritage Resources	Encourage preservation and restoration of historic structures and features in Kauaʻi's town centers	KIUC is currently diverting and using water from the North Fork Wailua River and Waikoko Stream. Operation of the Proposed Action would continue this use. However, water would be retained in the stream to maintain the IFS set by CWRM. Therefore, compliance with the IFS would have beneficial impacts to the streams and aquatic resources compared to current conditions, which would have beneficial impacts to cultural practices such as fishing and subsistence gathering.
	Preserve and protect the integrity of special places for current and future generations	
	Preserve access to wahi pana for traditional cultural practices	
	Celebrate the cultural and historic features that represent Kauaʻi's diverse cultural influences	

Figure 42. Kauaʻi General Plan Land Use



5 FINDINGS AND CONCLUSIONS

5.1 Significance Criteria

HAR 11-200 provides significance criteria for which all projects in Hawaiʻi are assessed. These significance criteria and their relationship to the Proposed Action are as follows:

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

Impacts from the Proposed Action would be short-term and temporary during the construction period. There would be no change of land use with implementation of the Proposed Action. The use of water from the North Fork Wailua River and Waikoko Stream Diversions would be reduced from historic conditions to maintain the IFS. The modifications to the diversion structures to maintain an IFS would be beneficial for downstream aquatic habitat and biota.

(2) Curtails the range of beneficial uses of the environment.

There would be no change to the current or potential land use within the project area with implementation of the Proposed Action. The use of the water from the North Fork Wailua River and Waikoko Stream would have a beneficial impact on air quality because of the continued operation of the existing hydropower plants and the commensurate reduction of greenhouse gas emissions verses using oil as a fuel source. The modifications to the diversion structures to maintain IFS would be beneficial for downstream aquatic habitat and biota compared to current conditions.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in HRS 344 and any revisions thereof and amendments thereto, court decisions, or executive orders.

The continued operation of the existing hydropower facilities for the next 65 years would decrease the required generation of electricity from fossil fuel sources. By displacing fossil fuel power generation, the Proposed Action is consistent with the long-term environmental policies or goals and guidelines expressed in HRS 344.

(4) Substantially affects the economic, social welfare, or cultural practices of the community or State.

Operation of the Proposed Action would allow KIUC to continue providing electricity with the lowest cost generation source. Operation of the Proposed Action also supports the county and state renewable energy goal of 100% renewable energy by 2045. Downstream users of water diverted for use at the hydropower plants would continue to benefit from supplemental flows available in the South Fork Wailua River. This includes thousands of acres of prime agricultural lands, potable drinking water facilities, public sports and recreation fields and facilities, civic and educational facilities, the Kauaʻi Gateway Project, and DHHL lands. Therefore, operation of the Proposed Action would have beneficial socioeconomic impacts.

(5) Substantially affects public health.

The Proposed Action would have some temporary, minor impacts on air, noise, and water quality during construction; however, these impacts would be minimized to the extent practicable by the employment of BMPs and compliance with permit conditions. The Proposed Action would not result in any post-construction or long-term effects on public health, although there may be health benefits that result from

the positive impact on air quality by the reduction of fossil-fueled energy generation and the associated air emissions.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities.

The Proposed Action would not have substantial secondary impacts, as it would not invoke population changes or effects on public facilities.

(7) Involves a substantial degradation of environmental quality.

No long-term impacts to any resource, as discussed in **Chapter 3**, are anticipated with implementation of the Proposed Action. Any impacts would be during the construction phase and would be short-term and temporary.

(8) Is individually limited but cumulatively has a considerable effect upon the environment or involves a commitment for larger actions.

The Proposed Action involves the continued operation of two existing hydropower plants through a 65-year lease to divert water at the North Fork Wailua River and Waikoko Stream Diversions. There would be no cumulative impacts from continued operation of the facilities. All potential impacts from construction of modifications at the diversions would be short-term and temporary during construction and would be minimized through the implementation of appropriate BMPs.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat.

Construction of the Proposed Action could have impacts to special status species.

Hawaiian waterbirds and the Hawaiian goose are known to occasionally use the streams and irrigation ditches in the project vicinity, primarily for feeding. Construction activities at the North Fork Wailua River and Waikoko Stream Diversions would have short-term and temporary impacts to foraging Hawaiian waterbirds. However, construction activities would be limited to two areas and it is expected that Hawaiian waterbirds would retreat from the area while construction is taking place and utilize other nearby streams and ditches for foraging. Although there are no known records of nesting within the project area, mitigation measures described in **Section 3.6.3** would be implemented to minimize potential impacts to Hawaiian waterbirds and the Hawaiian goose.

Impacts to seabirds could occur from the use of nighttime lighting during construction. Artificial lighting can adversely impact seabirds that may pass through the area at night causing disorientation, which could result in collision with manmade objects or grounding of birds. Impacts to seabirds would be minimized to the extent practicable through the implementation of mitigation measures described in **Section 3.6.3**.

Impacts to the endangered Hawaiian hoary bat could occur due to vegetation removal, which may occur at the North Fork Wailua River and Waikoko Stream Diversions. During clearing, grubbing, or tree trimming/cutting, the removal of tall, woody vegetation can temporarily displace bats using the vegetation for roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is likely to be minimal. However, during the pupping season from about June 1st to September 15th each year, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage, and very small pups may be unable to flee a tree that is being felled. Impacts to

the endangered Hawaiian hoary bat would be minimized to the extent practicable, as described below in **Section 3.6.3**.

(10)Detrimentally affects air and water quality or ambient noise levels.

Short-term, construction-related impacts would occur to air quality, noise, and water quality. A dust control plan would be developed and implemented to minimize fugitive dust during construction, to be approved by the DOH. To reduce noise exposure, construction activities would be conducted on weekdays and in daytime hours. In the event that work occurs after normal working hours (i.e., at night or on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring, as well as development of administrative and engineering controls, would be employed. Additionally, construction plans and specifications would include BMPs to minimize erosion on the project site during and after construction, as well as measures to contain runoff on-site during construction.

The Proposed Action would have beneficial impacts to air quality by reducing fossil-fueled energy generation and the associated air emissions. There would be no impact to water quality during operation of the Proposed Action as no additives are used.

(11)Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The existing Upper and Lower Waiahi Hydropower Plants and associated facilities are located in Flood Hazard Zone X and have been operational for 88 and 105 years, respectively, without significant damage from natural hazards. These facilities were built to withstand their natural environment, and it is expected that they would continue to do so after modifications are completed. Both facilities are unmanned. The only time personnel visit the facilities is for inspections and/or maintenance. Personnel would respond to any emergency messages or alerts as needed, using standard practices to ensure their safety during these visits to the facilities.

(12)Substantially affects scenic vistas and viewplanes identified in County or State plans or studies.

The Proposed Action would allow for continued operations at the Upper and Lower Waiahi Hydropower Plants. There would be no impact to visual resources.

(13)Requires substantial energy consumption or emit greenhouse gases.

Implementation of the Proposed Action would ensure the continued operation of KIUC's Upper and Lower Waiahi Hydropower Plants, which would further help to achieve the State of Hawaiʻi's mandate of 100% renewable energy by 2045.

5.2 Anticipated Finding of No Significant Impact

Based on the significance criteria set forth in HAR 11-200 and discussed in **Section 5.1**, it is anticipated that the Proposed Action would not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) would be filed with the State of Hawaiʻi Office of Environmental Quality Control following the public comment period.

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6 AGENCIES AND ORGANIZATIONS CONSULTED

6.1 Pre-Assessment Consultation

The following agencies and organizations were consulted during the preparation of the Draft EA. Those who formally replied are indicated by an asterisk (*). All written comments received during the early consultation period of the Draft EA and responses are included in **Appendix G**.

6.1.1 Federal

- U.S. Army Corps of Engineers *
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency

6.1.2 State of Hawaiʻi

- Department of Agriculture
- Department of Accounting and General Services
- Department of Business, Economic Development & Tourism
- Hawaiʻi State Energy Office
- Office of Planning *
- Emergency Management Agency
- Department of Hawaiian Home Lands
- Department of Health (DOH), Clean Water Branch
- DOH, Clean Air Branch
- DOH, Indoor and Radiological Health Branch
- DOH, Environmental Planning Office
- DOH, Office and Environmental Quality Control
- Department of Land and Natural Resources (DLNR), Land Division *
    - Division of Forestry and Wildlife *
    - Engineering Division *
- DLNR, State Historic Preservation Division
- Department of Transportation
- Office of Hawaiian Affairs *
- University of Hawaiʻi at Mānoa, Water Resources Research Center
- Senator Ronald D. Kouchi, Senate District 8
- Representative James Kunane Tokioka, House District 15
- Representative Nadine K. Nakamura, House District 14

6.1.3 County of Kauaʻi

- Mayor Bernard P. Carvalho, Jr.
- Councilmember Mel Rapozo
- Councilmember Ross Kagawa

- Councilmember Arthur Brun
- Councilmember Mason K. Chock
- Councilmember Arryl Kaneshiro
- Councilmember Derek S.K. Kawakami
- Councilmember JoAnn A. Yukimura
- Kauaʻi Emergency Management Agency
- Office of Economic Development
- Fire Department
- Department of Parks and Recreation
- Planning Department
- Public Works Department
- Transportation Agency
- Department of Water

6.1.4 Non-Governmental Organizations

- Sierra Club of Hawaiʻi
- Hawaiʻi Audubon Society

6.1.5 Landowners

- Grove Farm

6.2 Community Outreach

KIUC has conducted community outreach in numerous ways over the last several years on the operation of the diversions and the hydropower plants. Below is a listing of some of the outreach, although this is not an exhaustive list:

- Personally hosted trips by Brad Rockwell, KIUC Power Production Manager, to the North Fork Wailua River and Waikoko Stream Diversions and the hydropower plant facilities with community members including Kupuna on four occasions in January, March, and October 2016.
- Briefings with the Kauaʻi Chamber of Commerce, Native Hawaiian Chamber of Commerce, and Kauaʻi Economic Development Board in February 2018.
- Briefing with the Kauaʻi County Farm Bureau Board of Directors in November 2018.
- Public presentation to the Līhuʻe Business Association in April 2018.
- Public presentation to the Wailua-Kapaʻa Neighborhood Association in February 2019.
- Some of the recent meetings with concerned community members;
  - Hope Kallai and Bridget Hammerquist, HAPA – January 2018,
  - Kamealoha Hanohano Smith – February 2018 and February 2019, and
  - Blue Hole Working Group (defined by BLNR at December 2018 meeting) – January 2019.
- News releases:
  - December 2017
  - February 2018
  - August 2018
  - December 2018

- Guest editorial in The Garden Island newspaper
  - December 2016
  - December 2017
  - December 2018
- Information posted on KIUC's website, regular updates at KIUC Board meetings, and community testimony taken at multiple board meetings.
- Meetings with state agency representatives that received comments from community members, including meetings with, but not limited to, the following:
  - DLNR DOFAW – Kauaʻi and Honolulu
  - DLNR Land Division – Kauaʻi and Honolulu
  - DLNR Division of Aquatic Resources – Kauaʻi
  - CWRM

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7 REFERENCES

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APPENDIX A
Water Lease Documentation

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

REVOCABLE PERMIT NO. S-7340

KNOW ALL MEN BY THESE PRESENTS:

This Agreement is executed this 11th day of August 2003, by and between the STATE OF HAWAII, hereinafter referred to as the "State," by its Board of Land and Natural Resources, hereinafter called the "Board," and KAUAI ISLAND UTILITY COOPERATIVE, a Hawaii non-profit cooperative electric company, hereinafter called the "Permittee," whose mailing address is 4463 Pahee Street, Lihue, Hawaii 96766. The parties agree that commencing on the 1st day of January, 2003, ("commencement date"), Permittee is permitted to enter and use, on a month-to-month basis only, pursuant to section 171-58, Hawaii Revised Statutes, water emanating from, and the water transmission system situate at, Lihue-Koloa Forest Reserve, Wailua, Lihue, Kauai, tax map key no. (4) 3-9-1, as indicated on the map attached hereto, if any, and made a part hereof, also known as the "Blue Hole" diversion which is hereinafter referred to as the "Water Resources."

THIS PERMIT IS GRANTED UNDER THE FOLLOWING CONDITIONS:

A. The Permittee shall:

1. Use the Water Resources for the following specified purposes only: To divert, take, draw off, conduct away and dispose of government-owned water emanating from the Blue Hole diversion (which consists of both of the stream diversions located at Blue Hole on the North Fork of the Wailua River and the diversion at the Waikoko Stream above USGS Gage 612 all of which are collectively referred to as the "Blue Hole" diversion) and use, operate, repair and maintain a portion of an existing government-owned water transmission infrastructure system including the Blue Hole diversion all for the purpose of generating hydroelectric power with the Permittee's two hydroelectric plants.

2. Pay, at the Department of Land and Natural Resources Fiscal Office, P.O. Box 621, Honolulu, Hawai'i 96809, monthly rent in the sum of THREE THOUSAND ONE HUNDRED TEN DOLLARS AND NO/CENTS ($3,110.00) payable in advance by the first of each and every month.

PREL'M APPR'D
Department of the
Attorney General

The interest rate on any unpaid or delinquent rentals shall be at one percent (1%) per month.

If monthly rent is not received at the above address on or before the first day of the month for which it is due, then a service charge of FIFTY AND NO/100 DOLLARS ($50.00) a month for each delinquent payment shall be assessed and payable. The service charge is in addition to interest on unpaid or delinquent rentals. Interest shall not accrue on the service charge.

Payment of such service charge shall not excuse or cure any default by Permittee under this Permit.

3. Upon execution of this Permit, deposit with the Board an amount equal to two times the monthly rental stated above in paragraph 2, as security for the faithful performance of all of these terms and conditions.
The deposit will be returned to the Permittee upon termination or revocation of this Permit, if and only if all of the terms and conditions of this Permit have been observed and performed to the satisfaction of an authorized representative of the Department of Land and Natural Resources ("DLNR"). Otherwise, the deposit may, at the option of an authorized representative of the DLNR be applied toward payment of any amounts owed hereunder, without waiving any of the Board's other rights hereunder.

4. At the Permittee's own cost and expense, keep the government-owned improvements that are part of the Water Resources insured against loss by fire and other hazards, casualties, and contingencies, for the full insurable value of those improvements. The policies shall name the State of Hawaii as an additional insured and shall be filed with the Board. In the event of loss, damage, or destruction of those improvements, the Board shall retain from the proceeds of the policies those amounts it deems necessary to cover the loss, damage, or destruction of the government-owned improvements and the balance of those proceeds, if any, shall be delivered to the Permittee.

5. Give the Board twenty-five (25) calendar days notice, in writing, before ceasing use of the Water Resources.

6. Pay all applicable real property taxes assessed, if any, from the commencement date of this Permit.

7. At its own cost and expense, observe, perform and comply with all laws, ordinances, rules and regulations of all governmental authorities now or at

FORM APPR'D
Department of the
Attorney General

any future time during the term of this Permit applicable to the Water Resources including, without limiting the generality of the foregoing, the Americans with Disabilities Act of 1990 and all regulations promulgated with respect thereto, as well as any other laws, ordinances, rules and regulations imposing any requirements that the Premises be made accessible to persons with disabilities; and, indemnify the State of Hawaii against all actions, suits, damages and claims by whomsoever brought or made by reason of the nonobservance or nonperformance of any of said laws, ordinances, rules and regulations or of this covenant.

8. Repair and maintain all buildings or other improvements now or hereafter part of the Water Resources.

9. Obtain the prior written consent of the Board before making any major improvements.

10. Keep the Water Resources and improvements in a clean, sanitary, and orderly condition.

11. Pay all charges, assessments, or payments relating to the Water Resources including utilities.

12. Not make, permit, or suffer, any waste, strip, spoil, nuisance or unlawful, improper, or offensive use of the Water Resources.

13. At all times with respect to the Water Resources, use due care for public health and safety.

14. Procure and maintain, at its own cost and expense, in full force and effect throughout the term of this Permit, commercial general liability insurance, in an amount acceptable to the Chairperson with an insurance company or companies licensed to do business in the State of Hawaii. The policy or policies of insurance shall name the State of Hawaii as an additional insured. The insurance shall cover the Water Resources, including all grounds and all roadways on or adjacent to the Water Resources in the use or control of the Permittee.

    Prior to use of the Water Resources or within fifteen (15) days after the commencement date of this Permit, whichever is sooner, furnish the State with a certificate(s) showing the policy(s) to be initially in force, keep the certificate(s) on deposit during the entire Permit term, and furnish a like certificate(s) upon each renewal of the policy(s). This insurance shall not be cancelled, limited in scope of coverage, or nonrenewed until after sixty (60) days written notice has been given to the State.

APPROVED
Department of the
Attorney General

The State shall retain the right at any time to review the coverage, form, and amount of the insurance required by this Permit. If, in the opinion of the State, the insurance provisions in this Permit do not provide adequate protection for the State, the State may require Permittee to obtain insurance sufficient in coverage, form, and amount to provide adequate protection. The State's requirements shall be reasonable but shall be designed to assure protection for and against the kind and extent of the risks that exist at the time a change in insurance is required. The State shall notify Permittee in writing of changes in the insurance requirements and Permittee shall deposit copies of acceptable insurance policy(s) or certificate(s) thereof, with the State incorporating the changes within thirty (30) days after receipt of the notice.

The procuring of the required policy(s) of insurance shall not be construed to limit Permittee's liability under this Permit nor to release or relieve the Permittee of the indemnification provisions and requirements of this Permit. Notwithstanding the policy(s) of insurance, Permittee shall be obligated for the full and total amount of any damage, injury, or loss caused by Permittee's negligence or neglect connected with this Permit. It is agreed that any insurance maintained by the State will apply in excess of, and not contribute with, insurance provided by Permittee's policy.

15. In case the State shall, without any fault on its part, be made a party to any litigation commenced by or against the Permittee (other than condemnation proceedings), the Permittee shall pay all costs, including reasonable attorney's fees, and expenses incurred by or imposed on the State.

16. Pay all costs, including reasonable attorney's fees, and expenses which may be incurred by or paid by the State in enforcing the covenants and agreements of this Permit, in recovering possession of the Water Resources, or in the collection of delinquent rental, taxes, and any and all other charges.

17. Use of the water taken from the Water Resources shall be limited to the areas presently or formerly served. Expansion is not permitted.

18. The Permittee shall record and report monthly water use from the surface water diversions in accordance with Section 13-168-7, Hawaii Administrative Rules.

19. This permit shall cease and be void if the Board issues a lease pursuant to Section 171-58, Hawaii Revised Statutes for the Water Resources or portion thereof.

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20. The State reserves the right to withdraw water from this revocable permit to meet the following requirements as the State in its sole discretion may determine:

> Constitutionally protected water rights, in-stream flow standards, reservations needed to meet the Department of Hawaiian Home Lands rights under Section 221 of the Hawaiian Homes Commission Act, as well as other statutorily or judicially recognized interests relating to the right to withdraw water for the purposes of and in accordance with the provisions of Section 171-58(d), Hawaii Revised Statutes.

21. Prior to any expansion or modification of any diversion works applicable to this project, Permittee shall document all proposed modifications to the hydropower plant and diversion works, and submit such documentation to the Commission on Water Resource Management ("CWRM"), and obtain, if necessary, approvals from CWRM.

22. It is in the State's best interests to have its water returned to State land for irrigation purposes after its initial diversion for hydroelectric purposes, as previously existed when the prior lessee managed the system. To that end:

    a. The amount of water diverted into the ditch system at Blue Hole on an annual basis shall not exceed the average annual amount diverted as measured for the period from years 1992 to 2002.

    b. Any applicable service charge to the cooperative members, by Grove Farm, shall be for the upkeep of the delivery system, not for the water.

23. Within six (6) months form the date of Board approval, Permittee shall submit to the Board a report concerning the following matters:

    a. Permittee shall provide data concerning the amount of water diverted into the ditch system at Blue Hole: on an annual basis on average for the period from years 1992 to 2002, and for all prior months operated by the Permittee.

    b. Permittee shall provide data and recommendations concerning the allocation of water during low volume periods (e.g. drought) between the Blue Hole diversion, the Stable Storm diversion, the Wailua Reservoir diversion, and Aahoaka diversion.

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c. The water allocation proposal based upon Permittee's study and as agreed to by the Board is to be incorporated as a condition of this Permit upon Board approval.

B. Additional Conditions:

1. This Permit is issued and effective on a month-to-month basis. The Permit shall automatically terminate one year from the commencement date, unless earlier revoked as provided below, provided further that the Board may allow the Permit to continue on a month-to-month basis for additional one year periods. Any such extension shall have the same terms and conditions as this Permit, except for the commencement date and any amendments to the terms, as reflected in the Board minutes of the meeting at which the Board acts. Permittee agrees to be bound by the terms and conditions of this Permit and any amendments to this Permit so long as Permittee continues to hold a permit for the Water Resources or continues to use the Water Resources.

2. The Board may revoke this Permit for any reason whatsoever, upon written notice to the Permittee at least thirty (30) calendar days prior to the revocation; provided, however, that in the event payment of rental is delinquent for a period of ten (10) calendar days or more, this Permit may be revoked upon written notice to the Permittee at least five (5) calendar days prior to the revocation.

3. If the Permittee fails to cease the use of the Water Resources upon revocation or termination of the Permit, the Permittee shall be liable for and shall pay the previously applicable monthly rent, computed and prorated on a daily basis, for each day the Permittee remains in possession.

4. If the Permittee fails to cease the use of the Water Resources upon revocation or termination of the Permit, the Board, by its agents, or representatives, may, without notice, seize, remove and dispose of all vehicles, equipment, materials, or any personal property associated with the Water Resources, and the Permittee agrees to pay for all costs and expenses of removal, disposition, or storage.

5. The Board may at any time increase or decrease the monthly rental by written notice at least thirty (30) business days prior to the date of change of rent. Upon such notice, the Permittee shall deposit with the Board any additional monies required to maintain an amount equal to two times the new monthly rental as security for the faithful performance of all of these terms and conditions.

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6. Any major improvements erected on or in the Water Resources by the Permittee shall remain the property of the Permittee and the Permittee shall have the right, prior to the termination or revocation of this Permit, or within an additional period the Board in its discretion may allow, to remove the improvements from the Water Resources; provided, however, that in the event the Permittee shall fail to remove the improvements prior to the termination or revocation of this Permit or within an additional period the Board in its discretion may allow, the Board may, in its sole discretion, elect to retain the improvements or may remove the same and charge the cost of removal and storage, if any, to the Permittee.

7. The Board reserves the right for its agents or representatives to enter and inspect the Water Resources and use of the Water Resources at any time.

8. This Permit or any rights hereunder shall not be sold, assigned, conveyed, leased, mortgaged, or otherwise transferred or disposed of.

9. Permittee has inspected the Water Resources and knows the conditions thereof and fully assumes all risks incident to its use.

10. The acceptance of rent by the Board shall not be deemed a waiver of any breach by the Permittee of any term, covenant, or condition of this Permit nor of the Board's right to declare and enforce a forfeiture for any breach, and the failure of the Board to insist upon strict performance of any term, covenant, or condition, or to exercise any option herein conferred, in any one or more instances, shall not be construed as a waiver or relinquishment of any term, covenant, condition, or option of this Permit.

11. The use and enjoyment of the Water Resources shall not be in support of any policy that discriminates upon any basis or in any manner that is prohibited by any applicable federal, state, or county law.

12. Any and all disputes or questions arising under this Permit shall be referred to the Chairperson of the Board and his determination of these disputes or questions shall be final and binding on the parties.

13. Permittee shall not cause or permit the escape, disposal, or release of any hazardous materials onto or into the Water Resources except as permitted by law. Permittee shall not allow the storage or use of such materials in any manner not sanctioned by law or by the highest standards prevailing in the industry for the storage and use of such materials, nor allow to be brought onto or released into the Water Resources any such materials except to use in the ordinary course of Permittee's business, and then only after written notice is given to the Board of the identity of such materials

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and upon the Board's consent which consent may be withheld at the Board's sole and absolute discretion. If any lender or governmental agency shall ever require testing to ascertain whether or not there has been any release of hazardous materials by Permittee, then the Permittee shall be responsible for the costs thereof. In addition, Permittee shall execute affidavits, representations and the like from time to time at the Board's request concerning the Permittee's best knowledge and belief regarding the presence of hazardous materials on or in the Water Resources placed or released by Permittee.

Permittee agrees to indemnify, defend, and hold the State of Hawaii, the Board, and their officers, employees, and agents harmless from and against all liability, loss, damage, cost, and expense, including all attorneys' fees, and all claims, suits, and demands therefor, arising out of or resulting from the use or release of hazardous materials on the premises occurring while Permittee is in possession, or elsewhere if caused by Permittee or persons acting under Permittee. These covenants shall survive the expiration, revocation, or termination of the permit.

For the purpose of this permit "hazardous material" shall mean any pollutant, toxic substance, hazardous waste, hazardous material, hazardous substance, or oil as defined in or pursuant to the Resource Conservation and Recovery Act, as amended, the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, the Federal Clean Water Act, or any other federal, state, or local environmental law, regulation, ordinance, rule, or bylaw, whether existing as of the date hereof, previously enforced, or subsequently enacted.

14. Permittee shall indemnify, defend, and hold harmless the State of Hawaii, its officers, agents, and employees from and against all liability, loss, damage, cost, and expense, including all attorneys' fees, and all claims, suits, and demands therefor, arising out of or resulting from the acts or omissions of the Permittee or the Permittee's employees, agents, or officers under this Permit. The provisions of this paragraph shall remain in full force and effect notwithstanding the revocation, expiration, or termination of this Permit. The purchase of liability insurance shall not relieve Permittee of the obligations described herein.

15. Unless otherwise agreed by the Board in its sole discretion, payments received will be applied first to attorneys' fees, costs, assessments, real property taxes, or other costs incurred or paid by the Board with respect to the Water Resources, next to service charges or interest, next to any other charges due or owing under the Permit, next to delinquent monthly rent, and next to current rent.

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16. Any notice required or permitted to be given hereunder shall be in writing, given by personal delivery or by first class mail, postage prepaid. Notice to Permittee shall be delivered or addressed to the address stated above. Notice to State of Hawai'i shall be delivered or addressed to the Chairperson of the Board at 1151 Punchbowl Street, Room 130, Honolulu, Hawai'i 96813. Mailed notices shall be deemed given upon actual receipt, or two business days following deposit in the mail, postage prepaid, whichever occurs first. Either party may by notice to the other specify a different address for notice purposes, provided that Permittee's mailing address shall at all times be the same for both billing and notice. In the event there are multiple Permittees hereunder, notice to one Permittee shall be deemed notice to all Permittees.

17. Unless the text indicates otherwise, the use of any gender shall include all genders and, if the Permittee includes more than one person, the singular shall signify the plural and this Permit shall bind the persons, and each of them jointly and severally.

FORM APPROVED
Department of the
Attorney General

IN WITNESS WHEREOF, the STATE OF HAWAII, by its Board of Land and Natural Resources, has caused the seal of the Department of Land and Natural Resources to be hereunto affixed and the parties hereto have caused these presents to be executed the day, month and year first above written.

STATE OF HAWAII

By _____
Chairperson of the Board of Land and Natural Resources

Approved by the Board of Land and Natural Resources at its meeting held on December 13, 2002.

PERMITTEE

KAUAI ISLAND UTILITY COOPERATIVE, a Hawaii non-profit cooperative electric company

By _____
Alton H. Miyamoto
Its President + CEO

And By _____
_____
Its _____

APPROVED AS TO FORM:

_____
Deputy Attorney General

Dated 3/7/03

36714_1.DOC

STATE OF HAWAII)
) SS.
COUNTY OF KAUAI)

On this 28th day of March, 2003, before me appeared ALTON H. MIYAMOTO, to me personally known, who, being by me duly sworn and affirmed, did say that he is the President & CEO of KAUAI ISLAND UTILITY COOPERATIVE, a cooperative association formed pursuant to the provisions of Chapter 421C of the Hawaii Revised Statutes, and that said instrument was signed on behalf of said association by authority of its Board of Directors, and said officer acknowledged said instrument to be the free act and deed of said association.

LISA FERNANDEZ
NOTARY
PUBLIC
STATE OF HAWAII

Name: Lisa Fernandez
Notary Public, State of Hawaii
My commission expires: 8-11-06

APPROVED AS **AMENDED** BY THE
BOARD AT ITS MEETING HELD ON
JAN 1 2 2018

MINUTES
FOR THE MEETING OF THE
BOARD OF LAND AND NATURAL RESOURCES

DATE: FRIDAY, DECEMBER 8, 2017
TIME: 9:30 A.M.
PLACE: KALANIMOKU BUILDING
LAND BOARD CONFERENCE ROOM 132
1151 PUNCHBOWL STREET
HONOLULU, HAWAI'I 96813

MEMBERS

Suzanne Case
Thomas Oi
Stanley Roehrig
Samuel Gon
Chris Yuen
Keone Downing
James Gomes

STAFF

Russell Tsuji—LAND
Kevin Moore – LAND
Ian Hirokawa –LAND
David Smith--DOFAW
Ed Underwood – DOBOR
Aaron Stauch
Alton Miyasaka-DAR
Dre Kalili—DOT Harbors
Ross Smith-DOT Airports
Carl Young-HDOT Harbors
Dean Uyeno

OTHERS

Scott McCormack, D-12
Norman Uchida, D-4
Jim Sweeney, D1
Steve Gerber, D-1
Jim Coon, J-2
Winnifred Basques, J-2
Thomas Lim, D-9
Felicia Cowden, D-4
Jason Hines, D-4
Kip Goodwin, D-4
Marti Townsend, D-4
Greg Barbour, D7
Kaleo Manuel, DHHL, D-4
Robert Stellmacher, D-13
Ed Boteilho, D-15
Sol Kaho'ohalahala, D-4, J-2
Mary Oneha, D-10
Larry Geller, F-1
David Bissell, D-4
Sharon Goodwin, D-4
Bridget Hammerquist, D-4

Lokelani Mokuiki, D-4
Hope Kallai, D-4
Tim Kallai, D-4
Yvonne Izu, D-4
Larry Geller, F-2
Jeffrey Lindler, D-4
Jeff Clark, D-4
Annie Frederick, D-4
Debbie Lee-Jackson, D-4
Ilene Ketchline, D-4
Lance Collins, F-2
Bobby Grimes, D-15
Ed Olson, D-4

Chair Case called the meeting to order at 9:40 am. She announced that Items I-1, K-1 and D-8 are withdrawn and will not be heard today.

Case read the standard contested case hearing statement.

MINUTES

Items A-1 Request approval of May 26, 2017 meeting minutes.

Board Discussion
Gon and Gomes recused as they were not in attendance. Roehrig suggested that on the first page, the word "conveyed" to be changed to "convened." (Note: Changed sentence to read "She read the contested case advisory." Yuen, regarding Lanine or Lane Ka'ai'ai. Finalize with "Lane."

Public Testimony-None

Motion
Approved as amended (Roehrig/Oi). Unanimous.

Items A-2 Request approval of November 9, 2017 meeting minutes.

Board Discussion
Roehrig asked, regarding the Maui water Item on page 15, if the vote for 80MGD or 50MGD. He understood that he was voting on 50 MGD.

Yuen noted that he made the original motion, and listened to the tape of the motion. He said that the suggested change in MGD was not stated as an amendment and therefore was not put into the motion.

Motion
Approved as submitted (Yuen/Oi). 4 Ayes, 1 No. Roehrig opposed. Motion passed 4-1. (Gomes/Gon recused).

Item D-12 Consent to Assign General Lease No. S-6089, Turtle Bay Resort, LLC, Assignor, to BRE Turtle Bay Resort LLC, Assignee, Kahuku, Ko'olaupoko, O'ahu, Tax Map Keys: (1) 5-7-006:026, 027 & 032.

Russell Tsuji, Land Division, summarized the submittal. He noted that representatives from the seller and buyer are present. Tsuji gave some background on DLNR's acquisition of a portion of the property and a conservation easement over other parts of the property. What is before the Board today is a consent to assign the lease of about 57-acres around Kawela Bay. The lease allows use for recreational business uses. Cost of the lease is $239,000 with a premium of $119,500.

Board Discussion
Roehrig disclosed that Barry Sullivan, counsel for the buyer in the transaction used to be part of a law firm that he worked in. Roehrig does not believe the relationship will affect his vote. Roehrig did not work on this property and both he and Mr. Sullivan were in different law firms at the time of the sale.

Public Testimony-None

Motion
Approve as submitted (Gon/Gomes). Unanimous.

Item D-2 Approve and Delegate to Chairperson Authority to Execute Settlement Agreement with Hawaiian Telcom, Inc. Relating to Use of Communications Tower Site on Kaua'i Under Board Action February 11, 1983, Item F-11; Delegate Authority to Chairperson to Administer the Settlement Agreement, Including to Issue Final Approval of Work Under the Agreement; Terminate Occupancy Under Board's Prior Action February 11, 1983, Item F-11, *Direct Lease Public Utility Purposes*; Approve Issuance of Immediate Construction Right-of-Entry to Hawaiian Telcom, Inc.; Summit Camp, Wailua, Kawaihau, Kaua'i; Tax Map Key: (4) 4-2-001:002 por.

Russel Tsuji presented the staff submittal on behalf of the Land Division. This item is to approve a settlement agreement that staff negotiated with Hawaiian Telcom regarding lease rent for this parcel. He provided background on the situation. Tsuji noted that staff, the Deputy AG and Hawaiian Telcom staff were available to answer questions. Tsuji noted the difficulty tracking leases when land is transferred from one agency to another.

Board Discussion
Gon noted that his is an area with native vegetation, but none of the conditions address the native vegetation other than replanting for erosion control. He would like to add some conditions to address the native vegetation.

Amendment:

Consult with DLNR's Division of Forestry and Wildlife and the Kauai Island Invasive Species Council to minimize introduction of invasive species into the subject premises and surrounding Koloa Forest Reserve during an y phase of HTI's work under the Settlement Agreement.

Public Testimony-None

Motion
To approve as amended (Oi/Gon). Unanimous.

Item D-7 Consent to Assign Sublease K-6 under General Lease No. S-5619, BIG ISLAND ABALONE CORPORATION, Assignor, to KOWA PREMIUM FOODS HAWAII CORPORATION, Assignee, 'O'oma 1st, North Kona, Hawai'i, Tax Map Key: (3) 7-3-043:086.

Russel Tsuji presented the staff submittal on behalf of the Land Division. He outlined DLNR's relationship with NELHA, who is asking for a sublease approval. Part of the agreement is for the new tenant to keep as much existing staff as possible. KOWA staff are present to answer questions. Tsuji noted that in the past the Board has questioned why DLNR does not receive any income from these properties. He noted that NELHA uses most of the revenue that they generate for operations.

Board Discussion-None

Public Testimony-None

Motion
Approve as submitted (Yuen/Gomes). Unanimous.

Item D-1 After-the-Fact Consent to Merger of Integrated Aquaculture Hawai'i, LLC with and into Integrated Aquaculture International, LLC; Consent to 51% Stock Transfer in Sunrise Capital, Inc., Lessee Under General Lease No. S-4946, and Permittee under Revocable Permit No. S-7256, from Sunrise Capital, Inc. and Integrated Aquaculture International, LLC (via mesne transfers), Transferors, to Hendrix Genetics USA LLC, Transferee, Hanapēpē, Waimea (Kona), Kaua'i, Tax Map Keys: (4) 1-9-010:037 (lease) and (4) 1-9-010:034, 035, 038, and 1-9-011:007 (permit).

Kevin Moore presented for the Land Division. This submittal asks for consent for the assignment of a lease to Sunrise Capitol, Inc. Ultimately there is no payment to the State. Calculations are included in the submittal. One of the lessees did a corporate merger last year and did not come before the board. This submittal also takes care of merged corporation, as well. Staff recommendation is to approve.

Steven Gelber and Jim Sweeney said they had nothing to add, support the staff submittal and are available to answer questions.

Board Discussion
Oi asked why there is a negative premium when the lessee is a successful business. Moore said that the operations on the State lease is to sell to the local market, but the value of the company is in the brood stock operation, located on Non-state land.

Public Testimony-None

Motion
Approve as submitted (Oi/Gomes). Unanimous.

Item D-4 Holdover of Revocable Permits for Water Use on the Islands of Hawai'i and Kaua'i. See Exhibit 3 for list of Revocable Permits.

RP7340 will be discussed separately.

Ian Hirokawa presented for the Land division. This submittal is for holdovers for Revocable Permits for water uses on the islands of Hawai'i and Kaua'i. These RPs are largely for agricultural use, although there is one for power generation on Hawai'i Island. He noted that this is largely the same action as last year, so there are no changes. Hirokawa pointed out that Land Division has been talking to applicants to help move the process forward. They will meet with the users in Ka'ū, including DHHL, early next year to help them move their permits forward. They have also worked with DHHL on their beneficiary consultation to develop a water reservation.

Board Discussion
Yuen asked about the status of the proposal for ADC to take over the Ka'ū leases. Hirokawa said it is off the table because of concerns raised by OHA. Yuen pointed out that there are a couple of reasons for ADC to be the overall entity to apply for the water use:

1. There are no significant environmental issues, because this water does not feed perennial streams.

2. There is more water available than anyone is using.

3. Many of the permittees are small users and it will be very time consuming and expensive for them to go through the water application process, so it makes more sense for there to be an umbrella applicant.

3. DHHL will not get water unless someone develops it.

Yuen believes that there are only two ways to address the equitable distribution of water in Ka'ū, and that is to either have ADC be the umbrella agency to apply for a water permit and develop and manage the water, or to change the statute. Hirokawa noted that staff is sensitive to the issue and is working on ways to balance the needs of various users.

Tsuji said that Land Division understands the concern. He also provided some background on the legislation. Yuen noted that there was substantial and consistent opposition to the bill, so the legislation is what it is. However, his concern is how will these people have water to farm if they cannot meet the requirements by next year, which is when the bill sunsets. He feels the DLNR needs to find a solution for small farmers if we want sustainable agriculture in Hawai'i.

Roehrig noted that the Board had the same discussion a year ago. He agrees with Chris. ADC should be the focal point. Suggested having the board vote to have CWRM look at designating a water management area or to send it to ADC. There is big potential for agricultural development on Hawai'i Island, but they need to have a reliable source of water. Would like to move forward on this today.

Case noted that it is the applicants' responsibility to meet the requirements because they are applying for water use. Roehrig believes it is the responsibility of the Board to address the situation for small farmers.

Case noted that she agrees this is a problem, and the problem was noted when the legislation was passed. However, she wants to make clear that it is not the fault of the staff that there is not much motion. Yuen agreed and believes the statute needs to be reviewed.

Tsuji gave some background on DLNR's transfer of lands with water to ADC, including ADC's reasons for rejecting certain lands. AG Chow noted that water management areas can be designated for both ground and surface water. However, certain criteria must be met, one of which is that there is insufficient water for all uses. That does not appear to be the case here.

Oi asked if ADC will take over the East Kauai Water Use Cooperative (EKWUC) lands. Hirokawa noted that ADC did not want to take over the lands until the dam safety issues are addressed. Oi noted that there is difficulty filling the reservoirs to provide water to people in Wailua and Kapa'a.

EKWUC charges people to use the water. He noted that they try to provide water to all the farmers along their lines but they are struggling with maintenance issues. For example, vegetation control and debris removal are all under EKWUC. Oi noted that gentlemen farmers who use the water for landscaping do not maintain their water lines, so the farmers below them often do not get enough water. He believes that EKWUC water should not be used for landscaping.

Public Testimony

James Manaku—Believes that the water is DLNR's responsibility, rather than ADC. Water should be used for agriculture. Noted that water is disappearing. The streams are drying up. What will happen to future generations. Do not give the water to another agency and do not let it go to waste.

Kaleo Manuel, Planning Program Manager, DHHL. Friendly amendment. Omit Recommendation 1, because DHHL does not believe that the submittal is consistent with the Public Trust document. When asked, he noted that DHHL does not have written testimony because they were not afforded an opportunity review the submittal prior to the Board meeting. Manuel on

behalf of DHHL believes that the submittal does not address the following requirements of HRS 171-58:

- Public trust doctrine, including the effect of the Board's action on Native Hawaiians (§(c)(1)).
- DHHL was not notified of DLNR's "intent to execute any new lease, or to renew any existing lease of water rights," nor are homestead uses discussed in the submittal. (§171-58 (g))
- Discussion of the reservation of water rights for DHHL (§ 171-58 (g)).
- Evaluation of whether there is sufficient water for all users (§171-58 (g)).

DHHL also believes that the point of the statute is to evaluate whether there is sufficient water for present and future needs, which DHHL does not believe has been done.

DHHL continues to have concerns about a transfer of water leases to ADC. Manuel pointed out that their main concern is that ADC would not be able to meet the responsibilities of the state under HRS 171-58 because their mission is geared toward agriculture, rather than protection of the public trust. DHHL is willing to work through the issues.

Roehrig asked if there should be three different systems in different geographic areas.

Manuel noted that DHHL has needs for water but does not have a water reservation in Ka'ū.

Manuel noted that they have been working with BWS, who manages the system. DWS says there is not enough capacity on the system, so they are requiring DHHL to dig a new well, which DHHL does not think they should have to do. Therefore, they have been working with Land Division staff to identify the users of the 24 MG per year to see if they can take some of that water. They have been looking for practical solutions while protecting DHHL's rights. Users at the top of the system are getting water, while DHHL users, who are public trust users, but at the bottom of the system, are not getting access to the water. Yuen asked if DLNR permittees are tapping into DWS system. Manuel said that is correct, especially in two areas. Case clarified that the issue is delivery, not availability? Manuel said he was not sure, although DHHL thinks that there is enough water in the system. However, DWS says there is not enough source and are requiring DHHL to develop a new source.

Yuen asked if DHHL has concerns about other areas in Ka'ū?

DHHL does not have specific concern, but they have an overall concern regarding the valuation of water. DHHL is entitled to 30% of the revenue from water leases. They do not believe DLNR fairly values the use of water for private purposes. What is the return for the private uses of water vs Public Trust uses. This is complicated. One option is to use the cost of developing a watershed plan to value the water. DHHL is willing to work with all the applicants and the Land staff to develop a fair plan that recognizes DHHLs water rights.

Manuel agreed that who controls the water needs to be clarified and formalized. Is it DWS or CWRM or someone else? DHHL also needs clarification on how to get water downhill to the Hawaiian homes beneficiaries.

Jeff Clark, Chief Financial Officer for the Olson Trust Property in the Wood Valley area. Draws water from the Noguchi tunnel and transports it downhill. Feeds over 30 farms. He has spoken to other downhill farmers that would like more water, but that would require additional infrastructure investment. Olson Trust would like assurances that they will have access to the water to justify the infrastructure investment. They also have a hydro-electric plant.

Mr. Ed Olson, of the Olson Trust reiterated that they would like a long- term lease to justify their investment. Olson stated that they have invested $2 million in the water system to make water available despite not having any long-term rights.

Yuen pointed out that this system has nothing to do with Hawaiian Homes, as it is about 15 miles away.

There was a discussion of what steps the Olson Trust needed to go through to get their water lease. They were directed to talk to Land Division staff.

Roehrig noted that the Olson Trust is the main land owner in Wood Valley, Hilea and Kalaiki up to the forest reserve, so they are DLNR natural partners in developing the water in this area.

Sol Kaho'ohalahala, DHHL Beneficiary on the Island of Lanai. Supports testimony of Kaleo Manuel of DHHL. We are in times that require prudent and innovative thinking about water. Noted that these areas are known to Hawaiians some of the most productive farming lands, so use the traditional knowledge of Hawaiians when developing water in this area.

Motion
Yuen moved to approve the staff submittal with the following amendment for Ka'ū (excludes 7340):

1. Direct staff to work with RP holders to pursue long term leases, especially to look at the possibility of exempting RP holders from Chapter 343 requirements as appropriate and to pursue using existing the Ka'ū Forest Reserve Management Plan, as appropriate, to meet the requirements of HRS 171-58 as amended by Act 126 Session laws of Hawaii 216.

Yuen said he was not making any recommendation on ADC involvement in Ka'ū because it seemed like the Olson Trust was making major investments, and it might not be best to have the systems under one umbrella because the users in different areas would only be interested in maintaining their own systems.

Gomes asked about DHHL's suggestion to remove Recommendation 1. Yuen thinks that we are fulfilling Public Trust responsibilities. Gon agrees. Cannot have reservations to the Hawaiian homelands until infrastructure exists. They believe that the Public Trust document is being fulfilled, albeit imperfectly.

Roehrig wanted to add refinements to Yuen's amendments:

1) To the staff to divide their efforts between Waiohinu issues and the Olson Trust issues. He noted that the Olson's are a substantial land owner in Ka'ū. These issues should be addressed separately. He agreed with condition one, but wanted to add a condition 2:

2) Direct staff to work with DHHL and BWS to define jurisdiction over the Waiohinu Water, and to separate the county water allocation from the DLNR waters so that an adequate amount of water can be made available to that DHHL for its tenants.

Roehrig noted that he represented Hawaiians against sugar. At some point, much of that land went to the Olson Trust. Litigation terminated in late 90's. Has released his clients in that area. Feels he can vote and be fair.

Oi would like to expand the Chapter 343 exemptions and watershed management plans statewide.

Gon seconded the motion with the revision suggested by Oi and Roehrig. Unanimous

Amendments:

A. ***For those water RPs statewide that do not affect perennial streams, taro farmers or endangered flora or fauna, Department staff shall explore working with permittees Statewide to clarify lease requirements in HRS Section 171-58 in regards to compliance with Chapter 343, HRS, and the development of a watershed management plan, specifically whether certain leases may be exempted from an EA/EIS and whether existing watershed management plans are sufficient to meet the requirement of the statute.***

B. ***With regard to Ka'ū (Waiohinu), Department staff shall work with DHHL and the County of Hawaii Department of Water to explore releasing and separating the part of the water spring source that is the county water system, and determine whether there is any part over which DLNR may issue water leases to DHHL beneficiaries.***

Item J-2. Continuation of A Revocable Permit to Coon Brothers, Inc., a Hawai'i Corporation, for the Non-Exclusive Use of a Loading Dock and Submerged Lands at The Manele Small Boat Harbor (MSBH), Manele, County of Maui, Island of Lāna'i, Tax Map Key No. (2) 4-9-017: Por. 006.

Ed Underwood presented for the Boating Division.

Jim Coon and his attorney Lisa Bail addressed the Board and noted they are available for questions.

Board Discussion
In response to Downing's question regarding any other fees the Coon Brothers may pay, Chow confirmed that there is a statutory mooring fee of 3% of gross revenue for commercial vessels. The $1,000/per month is for use of the specific dock.

Public Testimony
Sol Kaho'ohalahala testified in support of the applicant. He noted that the Coons have provided job opportunities for generations of Lana'i residents, his family included. He supports their continued use of the dock so that they can continue to support the Lana'i community for more generations.

Winifred Basques testified in support of the Coons.

Motion
Approve as submitted (Gon/Gomes). Unanimous.

Gomes made a statement in support of Mr. Coons and his operation.

Item D-13 Issuance of Right-of-Entry Permit to Hawaiian Electric Company, Inc. on Lands Encumbered by Executive Order No. 1913 dated July 25, 1960 for Wahiawa Intermediate School Site, Wai'anae-Uka, Wahiawā O'ahu, Tax Map Key: (1) 7-6-001:003.

Kevin Moore presented for Land Division. This submittal is to allow HECO to use a part of Wahiawa Intermediate School as a helicopter landing area to make repairs to their line.

Board Discussion-None

Public Testimony-None

Motion
To approve item D-13 as submitted (Oi/Gomes). Unanimous.

Item D-9 Amend Prior Board Action of February 23, 2007, item D-6, As Amended: *Issuance of a Direct Lease to the University of Hawai'i, College of Tropical Agriculture and Human Resources, Fee Simple Conveyance of State Land to the Department of Hawaiian Home Lands and Amend Prior Board Action of September 25, 1998 (Agenda Item D-17), and May 9, 1997 (Agenda Item D-26), Ko'olaupoko, Waimānalo, O'ahu, Tax Map Key: (1) 4 -1-008:005, 79 and 80, and (1) 4-1-26: 004.*

The purpose of the amendment is to seek Board approval to authorize the issuance of a management right of entry permit to University of Hawai'i (UH) pending the issuance of a direct Lease for parcels of land at Ko'olaupoko, Waimānalo, O'ahu, Tax Map Key: (1) 4 -1-08:005, 080 (por.), and (1) 4-026:004.

Kevin Moore presented for the Land Division. The Land Division would like to transfer management authority for the land to UH while an EIS is on-going.

Board Discussion-None

Public Testimony
Thomas Lim, CETAR, noted that this is subject to the UH Board of Regents also approving.

Motion
To approve Item D-9 as submitted (Gon/Gomes). Unanimous.

Item D-4 Holdover of Revocable Permits for Water Use on the Islands of Hawai'i and Kaua'i. See Exhibit 3 for list of Revocable Permits. RP7340

Ian Hirokawa presented for the Land Division. RP7340 is for the Blue Hole diversion to support two (2) hydroelectric plants. Water goes from the North fork of the Wailua river to South fork of the Wailua River. The Division received much testimony in opposition because the use of the water has left parts of the stream dry. Staff notes that the hold over is to allow for completion of the IIFS from CRWM, and to allow the applicant to do Chapter 343 compliance. Staff recommends continuance of the hold-over to allow these things to happen.

Dean Uyeno and Aaron Stauch from CWRM discussed developing interim Instream Flow standards. Typically, they would look at the whole watershed area, which is happening. However, they are moving forward with IIFS in parallel, because it is a priority. The Study is limited to a specific area of the North fork around the diversion. They will assess all protected water uses in the area, and then make a recommendation on the IIFS. CWRM has been collecting data for the IIFS for over a year and should have a draft ready in 3-4 months. Then there will be time for public comments, then it goes to the Water Commission. Yuen clarified that CWRM had set Instream Flow standards in the 80's, but they are now doing a new study.

Case clarified how the system operates. She noted that this is considered a 100% diversion for a portion of the North fork, because the water is returned to the South Fork. Staff noted that the area from the diversion to the confluence of the North and South fork is dry. It is less than a mile. Staff also noted that water at the site of the vandalism is dependent on the flow of the stream.

Because Grove Farm may be a beneficiary of this water, Case noted that her cousin owns Grove Farm. However, she has no interaction with Grove Farm.

There was a discussion on the biology of Newcombe's snail. Critical habitat for the Newcombe Snail is above the diversion (at Blue Hole). CWRM staff noted that UFWS are responsible for a more thorough investigation of the snail's habitat.

Oi questioned whether it was possible to set Instream Flow standards for streams that had been diverted for decades. Stauch noted that they are only looking at two diversions (716 and 713). The study only looks at the (9) required uses of water, although they are trying to get information

from the agricultural users. Uyeno pointed out that the status of other diversions will also be included in the report. The Kapakahi Ditch, which is still in use, will not be considered in the report.

Public Testimony
KIUC:
David Bissell, KIUC CEO and *Jason Hines*, Jewel Group, Hydrologist. KIUC submitted written testimony. Bissell noted that this source of water is important to KIUC. The diversion has been producing energy for about 100-years. He does not believe that the stream is dry because since the vandalism, the stream does have water. He said the vandalism has only a minor impact on KIUC's use. Roehrig noted that CWRM staff testified that the stream is still dry.

Bissell testified that the hydro-electric powerhouses produce about one (1) megawatt of energy, which is enough to supply about 2% of the island's electric needs. However, hydro power is their lowest cost source of energy, so it is important to their renewable portfolio. *Felicia Cowden*—handed out copies of written testimony. Said that the real issue is that Grove Farm is not being held accountable for the water that it takes from this diversion. On low flow days, the water goes to the Waita Reservoir, which potentially provides capacity to develop the Puhi area, all Grove Farm lands. Grove Farm makes about $2M year for transmitting water to the County, but because of the diversions, DHHL does not have water, because there is no transmittal mechanism. She suggested one possible solution is to return 50% of water to all (5) streams being diverted in the area.

Roehrig asked the AG if the State is entitled to income from the transmission of water? Chow said "no" because they are selling the cost of transmission, rather than selling the water. AG has not put out a written opinion on this matter.

Case pointed out that Cowden was talking about a much bigger issue if additional waters were feeding the same line. She asked Board Members to limit their questions to the hydroelectric diversions.

Bridget Hammerquist noted that this is not limited to two diversions. She said that the dry stream is the current condition because the damage from the vandalism was repaired, so most of the water is still being diverted. She suggested the Board do a site visit. Noted that Kiai Wai o Wai'ale'ale was formed to protect and preserve the waterfall from Wai'ale'ale. Water from five (5) streams in the Wai'ale'ale watershed are all being diverted for hydro power (Wai'ale'ale, Waikoko, 'Ili'ili'ula, Waiaka, Wailea). If there was a watershed management plan in place the Board could see that they were all involved. After the water is diverted it goes to the South Fork of the Wailua River, and then there is a 100% diversion into the Hanamaulu Ditch and then to the Kapaia Reservoir. The upper and lower Līhu'e Ditches then also go to Kapaia Reservoir, but some of it gets treated by Grove Farm and sent to County. County has about 800,000 gallons in reservoirs She noted that the authorized use of water is supposed to issue subsequent to EIS, CDUP and a permit.

It is unfair to only recognize two (2) diversions when (6) streams are being diverted
Hammerquist noted that at the October 26 Kauai County Council meeting, Curt Saiki described the uses for the Grove Farm Water. He admitted that they told DHHL that there was not enough water for their use because DHHL is beyond their service area. However, the County amended its policy to serve a new development beyond their services area, but failed to notify or serve DHHL.

Proposed Solution:
Restore 7-MGD to stream so that DHHL could get water.

Hammerquist noted that the elevation of the diversion is 1,106 FASL, which means that the mauka service of the dam is above the critical habitat. She also indicated the DHHL lands in question are on the Līhu'e side of the Wailua River, causing Yuen to ask how reducing the diversion would help supply water to DHHL lands.

Oi disclosed that his company does major work for Grove Farm.

Hammerquist noted that Grove Farm might not be aware that they may be in violation for their use of water. Roehrig noted that the State has a trust responsibility to be fair about the distribution of water, and to collect income from people charging for the water.

1:15 pm: Break for Lunch
1:55 pm: Reconvene

Sharon Goodwin from Wailua Homesteads, Kauai. Testified that she is concerned about the Wai'ale'ale Diversions for KIUC. Wants KIUC to do a watershed management study, CDUP, and habitat conservation plan. Testified to the deleterious effects of the dry stream area on native flora and fauna and on Hawaiian traditional practices. Showed pictures.

Kip Goodwin on behalf of the Kauai Group of the Kauai Chapter of the Sierra Club. KIUC diverts 100% of the base water flow of the Wailua Stream as well as other streams. Testified as to the deleterious effects of the diversions on native flora and fauna. Requested that KIUC be held to the requirements of Act 126, and all other laws. Request that the Board immediately restore and maintain stream flow.

Marti Townsend, Sierra Club. Testified that the Sierra Club is supportive of the Kauai Group. Also noted that Sierra Club has concerns about RP's overall. Challenged Mr. Bissell's testimony that hydroelectric is the least costly form of energy when they have not measured the cost to the environment. Argued that the RP should only be issued after an EIS has been completed. Asked the Board to immediately restore 7-MGD for DHHL use.

Lokelani Mokuiki is from a line of taro farmers who traditionally cultivated lo'i in the valleys of the Napali Coast and Hā'ena. She testified as to the difficulty of accessing State Park lands to visit family lands that are now located in the Parks. She asked the Board to protect traditional rights to use water from Mauka to Makai and for denial of the RP. She also showed a photo of the dry area of the stream.

Hope Kallai on behalf of the Pupu Wailani (Newcombe Snail) asked for 7-MGD, the amount of the DHHL reservation, to be restored on Monday. This water should remain in the stream until DHHL needs it. She requested that the RP be held until KIUC is compliant with all requirements. Showed a PowerPoint with pictures of blue hole and the diversion and pointed out that the blue hole area is used for hunting, traditional practices, and recreation. She does not believe 100% of the base flow was always diverted.

Yuen asked about the tie in to the Department of Hawaiian Homes. If the Hawaiian Homes development is on the south side of the Wailua River, how does keeping water in the North Fork help Hawaiian Homelands? Kallai said that the Stable Storm ditch intersects the North Fork of the Wailua River, and it can re-water the ag lands between the two forks of the Wailua River. Kallai presented a map that showed the ditches on DHHL lands that can take water from the North Fork. This would keep the water in Wailua. Currently water goes out of Wailua to other ahupua'a.

Kallai estimated that base flow is about 13-15 MGD. A little over half would need to go back into the stream to meet the DHHL reservation. Yuen noted that according to information provided by KIUC the base flow in a dry period would not be as high as she is suggesting. Kallai noted that her calculation does not include other streams.

Kallai noted that people are testifying this year, because DLNR has reclassified the diversion as a consumptive, rather than non-consumptive use of the water. This is the result of a contested case filed by OHA. There was an MOA developed between OHA and KIUC, so the contested case never came before the Board.

Oi noted that the management of the water is under the management of the West Kauai Cooperative and they have not maintained the ditches or land. KIUC is not the only party to blame. Kallai agreed and noted that there is enough water in a Grove Farm reservoir to allow DHHL use as separate and independent water source.

Annie Frederick, Statewide Director of the Hawaii Alliance for Progressive Action testified in support of other testifiers. Asked that Board restore stream flow below the diversion.

1. Restore water to the streams
2. Ensure no traditional cultural practices impacted
3. Consider DHHL's need for water and for their fair share of revenues.
4. Compliance with all laws and permit requirements.

Frederick made a verbal request for a contested case.

Debbie Lee Jackson. Kuleana land owner and taro farmer from Kauai. Noted the Board is violating her right as a beneficiary under 5(f), by

- not protecting 5(f) lands,
- not protecting the water,
- not protecting her rights to her traditional practices.

She is emotionally and physically affected by the taking of the water. She orders the Board to restore the water and to direct CWRM to rework the plantation water permits.
Tim Kallai. Testified as to the importance of water for recreation and traditional practices. Noted that safety features were removed from the ditch and showed pictures of the gates that were removed. He pointed out that Kaua'i has a unique hydrological system, unlike the other islands. The Board needs to ensure that the Public Trust doctrine is met because the viability of the people on Kaua'i, especially those in Wailua are reliant on the mauka to makai flow of the water. He noted that the power plants were originally created to run the mills, not a large scale commercial plant. If the water is restored to the stream, the power plant will still operate.

Ilene Ketchline. Testified that there are good alternatives to allowing the diversion. Argued that KIUC, using new storage technology, could purchase excess solar energy from residents and increase the use of solar on Kauai. Hydro-power is not considered green because it is a consumptive use.

<u>Follow up Board Questions to KIUC</u>
Yuen asked if they are doing an environmental assessment. *Yvonne Izu* responded they were exempt from Chapter 343 because it was a continuing use. However, KIUC and OHA settled OHA's request for a contested case with an MOU. One requirement of the MOU was that KIUC conduct a stream biota study and a habitat study. Yuen clarified that KIUC will ask for an exemption in 2-years? Izu said yes. Yuen said that the Board could still ask them to do an EIS. Izu said that was true, and they may change their minds. The major studies are already done, so they may decide it is more prudent to do the 343.

Is anyone working on a water management plan? Yes and no. Another condition was that KIUC join the Kauai Water Alliance, but they were not allowed because they are not a land owner. The question is how to satisfy the watershed management requirement if you are not a landowner? Is the State giving direction as to what should be in a water management plan? Yes, there is a large group of people talking about how to meet the requirements of Act 126. One solution is to have DOFAW provide guidance, since they have done watershed management plans.

Case noted that the Watershed Conservation Alliance is made up of large landowners. Presumes that the point is for the users to acknowledge their reliance on the watershed they are in and to acknowledge that they rely on the prudent use of that water. DLNR has many excellent watershed management plans, but there needs to be a link between the users and the landowners. Perhaps a part of the link is to ensure that the users acknowledge the importance of the watershed and make a commitment to follow the plans.

How much water comes out of these streams? *Jason Hines* said he can find out what the records include (Exhibit 5A and North Wailua Ditch below Wailua steam). They are compiling new records on both diversions going forward. The North Wailua Ditch information is for the Ditch and does not reflect what is in the stream. The amount of water taken shown in their reports may be less than the flow in the stream, even in low flow periods, because sometimes the ditch is clogged and water does not flow into it.

Roehrig asked what if KIUC opened the North Fork at various levels and figured out impact on hydroelectric production, so BLNR can make a more educated decision. Bissell said that they probably could get the information without restoring flow. He noted that the IIFS decides what the stream needs first, and then what KIUC might need. Izu stated that the RP runs out on December 31. Roehrig asked how long it would take to report how much water could be diverted without affecting the hydroelectric plants. Bissell noted that there are several diversions that could affect the data, not just the diversions under discussion today.

Oi stated that the diversion that feeds the Hawaiian Homelands is under the East Kauai Water users cooperative. He asked if KIUC would be willing to open the diversion to allow the streams to flow again. Bissell said "Yes, with conditions, and after the IIFS is set." It has always been intent of KIUC to modify the diversion to allow more stream flow.

Yuen noted that he would like water to flow in the stream, but believes that they would need get a permit from CWRM to remove structures.

Downing said if the diversion was open could you still conduct your business? Yes, but the cost of energy would go up, and the amount of renewable energy would go down.

Yuen/Gon—moved to go into executive session. Unanimous.

Board returned at 4:04 pm

<u>Motion</u>
To deny request for contested case based on advice of counsel (Yuen/Oi). Unanimous.

Yuen asked if AG could talk about non-conforming uses that are grandfathered. Chow addressed the issue, stating that generally, uses that began before the establishment of the conservation district law (1964) were allowed to continue without needing a conservation district use permit.

To approve the holdover of RP7340 with amendments (Oi/Yuen). Unanimous.

Amendment:

1. ***Within one year, KIUC will provide the Board with a proposal for the partial restoration of flow to the Wailua river (which could be satisfied by the adoption of interim instream flow standards).***
2. ***Direct DLNR staff to work with landowners on what is expected for the watershed management plan.***
3. ***KIUC shall consult with DHHL and honor DHHL's reservation rights of water under the law.***

Gon agrees.

Downing will vote no because he believes there is a need to change people's mindsets to look at what is best for everyone. He believes the Board needs to be proactive.

Roehrig will also vote "no" for substantially the same reason. He believes at least some water should be restored now, and KIUC can see if it works out or not. Agrees that the Board needs to be proactive.

Gomes will also vote "no" for the same reasons.

Vote
4 Ayes, 3 Nays. Motion passes. Downing, Roehrig and Gomes opposed.

Item D-15 Rescind Prior Board Action of August 12, 2016, Agenda Item D-3, Consent to Assign General Lease No. S-6024, Boteilho Hawaii Enterprises, Inc., Assignor, to Mauna Kea Moo, LLC, Assignee;

Consent to Assign General Lease No. S-6024, Boteilho Hawaii Enterprises, Inc., Assignor, to HFD Farms 1, LLC, Assignee 'Opihikau-Huki'a'ā, Kokoiki, North Kohala, Hawai'i, Tax Map Keys: (3) 5-5-003:004, 005 & 006, 5-5-005:001, and 5-5-006:002, 003,004 & 015; and

Reaffirm Set Aside to Department of Agriculture, 'Opihikau-Huki'a'ā, Kokoiki, North Kohala, Hawai'i, Tax Map Keys: (3) 5-5-003:004, 005 & 006, 5-5-005:001, and 5-5-006:002, 003,004 & 015.

Kevin Moore presented for the land division. This is for a dairy lease on the North Kohala district of the Big Island. Approval to assign the lease to HLD Farms LLC. There is a negative share to the State on the premium assignment. They are expecting a "no further action" letter regarding the storage tanks on the property. State takes the position that they have no responsibility for the storage tanks.

Board Discussion
Downing asked about the premium assignment. Moore noted that the premium assignment is to discourage speculation on state leases, so investments (improvements & fixtures) in the land are discounted in the analysis.

Ed Boteilho Jr, President of Clover Leaf Dairy at Upolu Point. Has been in business in that area since 1989. He is looking forward to the transfer but there are conditions. 1) Noted that HLD Farms LLC has not put money in escrow. 2) Underground Storage Tanks (UST) were installed in the 1970's. He did not take responsibility for it, because Clover Leaf Dairy did not put it in. He believes DLNR is responsible. The new buyer has requested that the USTs be removed so Boteilho removed USTs. Costs for removal and remediation have escalated to over $100,000. He has incurred tremendous costs for something that he did not put in and did not use. Would like to have the clean-up transferred over to the DLNR before its transferred to DOA.

Case clarified that he does not want to transfer the lease until there is money in escrow. She believes that the board can allow the transfer, but if the condition is not met, he does not have to transfer the lease.

Regarding the second issue, Kevin Moore stated that Land Division's position is that they did not know that the tanks were there. Boteilho disputes that position. He also reiterated his objection to a transfer to DOA before the tanks are cleared up.

Roehrig disclosed that he was on the Kohala Task Force. He noted that the tanks were a state project. Therefore, he takes exception to the idea that the state has no liability for its own project. The Kohala Task Force was created by Governor Ariyoshi's administration to address the closing of Kohala Sugar.

Roehrig left the meeting (4:31)

Case clarified the request that the land not be set aside to DOA until the lease is transferred. Boteillo agreed that was correct.

Yuen asked if the gist of his issue is that he wants the State to reimburse him for the money that he spent on the remediation? Boteillo said his concern is that DOA will not be concerned about the tanks, but the DLNR is aware of the lease concerns. Yuen clarified that by consenting to the assignment the State is not asking for Boteillo to give up any of his claim. Boteillo stated that he was unaware that the earlier reassignment was approved. He had objected to it because of the issue of the USTs.

Public Testimony
Bobby Grimes, representative of the new owners testified that they cannot get a title guarantee without the lease transfer. The new owners will take on the testing and backfill of the contaminated soil.

Motion
Approve staff recommendation, noting that the Board approval is without prejudice to Mr. Boteillo's ability to claim reimbursement for removal of the USTs (Yuen/Gon). Unanimous.

Item D-10 Amend Conditions for General Lease No. 6056 to Waimānalo Health Center for Community Service Purposes by (a) Expanding Lease Area, and (b) Allowing Subletting and Mortgaging with Prior Approval of the State of Hawai'i as Lessor; and

Consent to Sublease for Community Service Purposes, Waimānalo Health Center, Sublessor; Roman Catholic Church in the State of Hawai'i, Sublessee; and

Consent to Federal Interest regarding a Two-Story Medical Building; Waimānalo Health Center, Lessee; Waimānalo, Ko'olaupoko, O'ahu, Tax Map Key: (1) 4-1-015: portion of 001.

Kevin Moore presented for the Land Division. This is for Waimanalo Health Center to sublease of portion of newly acquired property to the Roman Catholic Church. Staff recommendation is to consent to sublease and to the required federal language.

Board Discussion-None

Public Testimony-None

Motion
Approve submitted (Gon/Oi). Unanimous.

Item D-14 Consent to Federal Interest Affecting Property Located on the Land Covered by General Lease No. S-5981; Consent to the Construction of the Lower Floor of Malama Recovery Building; Wai'anae District Comprehensive Health and Hospital Board, Incorporated, Lessee; Lualualei, Wai'anae, O'ahu; TMK (1) 8-6-001:003.

Kevin Moore presented for the Land Division. This is to consent to Federal interest for a project at Malama Recovery Building at Waianae. The Federal interest is a part of the grant received by Waianae Coast Comprehensive. The submittal will need to be amended because they just learned that the amount of the grant is increasing to $1.7M.

Board Discussion-None

Public Testimony-None

Amendment:
Change the amount in recommendation to $1.7 M

Motion
Approve as amended (Oi/Gomes). Unanimous.

Item M-12 Issuance of a Revocable Permit to HPBS, Inc. for Harbor Pilot Operations at Pier 19, Honolulu Harbor, Hawaii.

Item M-13 Direct Issuance of a Revocable Permit for Clean Island Council Operations at Pier 12, Honolulu Harbor, Hawaii.

Carl Young for State Harbors was present to answer questions.

Board Discussion-None

Public Testimony-None

Motion
Approve Items M-12 and M-13 as submitted (Gomes/Oi). Unanimous.

Item M-11 Issuance of a Right of Entry to the Hawaii Opera Theatre at Honolulu Harbor O'ahu, Tax Map Key No. (1) 2-1-001 Portion of 1.

Dre Kalili for HDOT Harbors noted that this was an ROE to Hawaii Opera theater to put on a performance in one of its cruise terminals. This is a ROE for 17 days.

Board Discussion-None

Public Testimony-None

Motion
Approve Item M-11 as submitted (Gomes/Gon). Unanimous.

Items M-1-M-10

1. Issuance of a Direct Lease for the Construction of an Airline Lounge to All Nippon Airways, 'Ewa Concourse, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-003: 066 (Portion).

2. Issuance of a Revocable Permit for a T-Hangar for Storage and Maintenance of Aircraft, East Oahu Pet Hospital, LLC dba Gentle Vets Hawaii, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-76: Portion of 20.

3. Issuance of a Revocable Permit for an Employee Parking Lot, Hawaiian Airlines, Inc., Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-004: 006 and 1-1-004: 007.

4. Issuance of a Revocable Permit to Kone Inc. for Space to Store Escalator Materials, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-003: 085 (Portion).

5. Issuance of a Revocable Permit for a T-Hangar for Storage and Maintenance of Aircraft and Air Tour Operation, Lani Lea Sky Tours LLC, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-76: Portion of 21.

6. Issuance of a Revocable Permit for Aircraft Parking, Kimball S. & Deborah S. Millikan, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-76: Portion of 23.

7. Issuance of a Revocable Permit for Aircraft Parking, Michael James Tompkison, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-76: Portion of 23.

8. Issuance of a Revocable Permit for an Employee Parking Lot, United Parcel Service, Inc., Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-003: 001 (Portion) and (1) 1-1-003: 240 (Portion).

9. Consent to Sublease of State Lease No. DOT-A-17-0002, Scannell Properties #271, LLC to Federal Express Corporation, Hilo International Airport, Tax Map Key: (3) 2-1-12: Portion of 90.

10. Issuance of a Revocable Permit for Aircraft Parking, NSA OPS LLC, Kahului Airport, Tax Map Key: (2) 3-8-01: Portion of 19.

Ross Smith from DOT-Airports was available to answer questions.

Board Discussion-None

Public Testimony-None

Motion
Approve Items M-1 through M-10 as submitted (Gon/Gomes). Unanimous.

Item F-1 Request for Approval to hold Public Hearings to Amend Hawai'i Administrative Rules Chapter 13-74, License and Permit Provisions and Fees for Fishing, Fish, and Fish Products. These Amendments would establish a New Vessel License for Commercial Fishing.

Item F-2 Reconsideration of Request for Approval to adopt Amendments to Hawai'i Administrative Rules, Chapter 13-74: amending Section 13-74-20 (Commercial Marine License) and Adding Section 13-74-46 (Commercial Marine Dealer Report).

Alton Miyasaka presented both Items for DAR. They were taken concurrently at the request of the Board. Item F-1 is a request for approval to go to public hearings for proposed new vessel license. There is one change: to charge non-long-range vessels $300 for a license, rather than $400. Miyasaka also wanted to advise the Board that they are in discussion with DOCARE about the costs to enforce. Discussions are on-going so it is likely that the rules will come before the Board again.

Item F-2 is a request for reconsideration of a request for approval to adopt a commercial Marine License and add a Commercial Marine Dealer Report. This had come before the Board last month and did not pass, so they are bringing it again.

Gomes noted that he has been bombarded with phone calls opposed to the fee. People are wondering why long-liners are not getting a fee.

Miyasaka noted that DAR is at the tail end of the process for the fee increase. However, they are at the beginning of the process for the vessel license. There will be an increase in individual commercial marine licenses until the Vessel license is established.

Downing noted that the individual license is an interim measure to ensure adequate funding for DAR. Suggested that the individual license be $100, and then push to get the vessel license done.

Case asked if, when the vessel license is in place can they push the individual license up to $150?

Miyasaka said that they anticipate that the vessel license will be the main income generator, so the push will be to ensure that they charge enough for the vessel license to meet department needs. Miyasaka noted that there are enforcement challenges between trolling fishers and bottom fishers. The vessel license will address this issue.

Oi reiterated that he is against raising the individual fee and will vote no. People that he has talked to are willing to pay $150 per boat, but not per person. Gomes agreed.

Miyasaka gave two examples of the effects of funding shortages. Case pointed out that DAR has insufficient funds to do the things it is mandated to do.

Gomes noted that they will still be short once the vessel fee goes into effect. Miyasaka pointed out that the rule change includes charging $1,500 for long-line vessels, so the bulk of funding would come from long-liners, if the rule passes in its current form.

Public Testimony
Larry Geller, believes that the statute requires individual licenses, not vessel licenses. Administrative Rule changes will exacerbate unfair labor practices on the long-line vessels. Chow clarified that he is testifying regarding Item F-1.

Lance Collins, on behalf of Malama Chun. Testified in opposition to F-1. Does not believe that the vessel license complies with statute as written. He is testifying regarding the long-line fleet. A per vessel license for the long-line boats will further eliminate any oversight that the State has regarding foreign labor on the long-line fleet.

Gon moved, per AG advice, to table Item F-1 and direct staff to consult with the AG on the legality of the vessel license. Yuen thought that the Board could authorize the rule making process, and to consult with the AG. That way if the AG says no, they just will not proceed, rather than having to come back to the Board. Case agreed.

Miyasaka noted that the informal public discussions that would inform the rule are currently taking place. These discussions will inform how the rule is drafted. He agreed that F-1 is premature, but the Board asked for DAR to bring it forward with the individual license.

Yuen and Gon both agreed that the long-liner labor issue is a critical one but there should be some way to separate it from the licenses.

Amendments to Item F-1:

1. ***Change the charge for long range vessels to $300 from $400.***
2. ***Staff to immediately consult with AG regarding legality of the proposed rule.***
3. ***Each boat to provide a listing of who is on the boat and covered by the license.***

Motion
Yuen move to approve Item F-1, as amended. Oi second. Unanimous.

Amendment to Item F-2:

Decrease fee to $100.00

Motion:
Approve as amended (Yuen/Gon). Vote: 4 Ayes, 2 Nays. Oi/Gomes opposed. Motion passes with amendment.

The Board noted that this was Alton Miyasaka's last meeting and thanked him for his service.

Item E-1. Approval to Continue Twenty (20) Revocable Permits for Use of State Parks Lands on the Islands of Kaua'i, O'ahu, Maui, and Hawai'i for the following: Kaua'i: Na Pali Kayak Inc., Kayak Kaua'i, a Hawai'i Limited Partnership, Rick Haviland, dba Outfitters Kauai (Napali Coast State Wilderness Park for Commercial Kayak Landings), Clancy Greff dba Na Pali Eco Adventures, Inc, Na Pali Sea Tours, Inc., Lady Ann Cruises Inc., (Napali Coast State Wilderness Park for Inflatable Boat Landings), Ka Imi Naauao o Hawai'i Nei, Kaua'i Christian Fellowship, (Waimea Canyon State Park Non-profit Recreation-Residence/Camps), Hawai'i Conference Foundation (Koke'e State Park non-profit camp), O'ahu: Diamond Parking Services, LLC (Nu'uanu-Pali State Wayside, Parking Concession), Bottling Group, LLC, (Diamond Head State Monument beverage vending), Erlinda Molina Villanueva (Ahupua'a O Kahana State Park, Agricultural use), Young Men's Christian Association of Honolulu, Hawai'i Climbing Coalition, (Ka'ena Point State Park, Outdoor Recreational Activities), Maui: Republic Parking Northwest, Inc. ('Iao Valley SM, Parking Concession), Hawai'i: Republic Parking Northwest, Inc. (Hāpuna Beach SRA, Parking Concession), Diamond Parking Services, LLC ('Akaka Falls State Park, Parking Concession), Adventures in Paradise, Inc., Kona Boys, Inc., Iwa Kalua (Kealakekua Bay State Historical Park, Commercial Kayak Tours). See attached Exhibit A for a list of Revocable Permits.

Curt Cottrell, presenting for State Parks, said he needed to make 2 corrections to the submittal because the list of submittals is not exhaustive.

Board Discussion
Downing asked how State Parks enforces the $5 per person or 5 % of gross base rent. Cottrell responded that the $5 per person is difficult to enforce because there is not enough staff to monitor the per person counts. The percent of gross is easier because they can review the RP holder's books.

Public Testimony-None

Amendment:

1. ***Amend exhibit to read "revocable permit approval list 2018," rather than "Revocable Permit Master List 2018."***

2. ***Under DISCUSSION on page 2, change "There are currently 20 RP's DSP is asking to be renewed" (2nd full paragraph) to "DSP is seeking approval for 20 RPs under these general categories."***

Motion
Approve as amended (Oi/Gomes). Unanimous.

Remaining Items: C-1. D-3, D-5, D-6, D-11, J-1 and J-3.

Item C-1 Authorize the Division of Forestry and Wildlife to Conduct a Public Hearing on the Island of Kaua'i Regarding the Proposed Addition of Tax Map Keys (4) 2-4-003:001 Comprising Approximately 163.842 Acres, to Līhu'e-Kōloa Forest Reserve, Kōloa, Kaua'i, and the Proposed Withdrawal of Tax Map Keys (4) 3-9-002: Portion of 001, Comprising Approximately 1467 Square Feet, from Līhu'e-Kōloa Forest Reserve, Līhu'e, Kaua'i.

Item D-3 Amend Prior Board Action of January 8, 2010, Item D-24:

RE-SUBMITTAL:

(1) Grant of Perpetual, Non-Exclusive Easement to Kauai Island Utility Cooperative and Hawaiian Telcom Inc. for Utility Purposes covering Tax Map Keys: (4) 4-1-3: portion 44 and 17;
(2) Issuance of a Right-of-Entry to the Department of Transportation, Highways Division for Construction, Staging and Work Area Purposes covering Tax Map Keys: (4) 4-1-3:44, 17 and 4-1-4: portion 21, 22, 24;
(3) Cancellation of Revocable Permit No. S-7444 Covering Tax Map Key: (4) 4-1-3:17; and
(4) Issuance of a Revocable Permit to the Department of Transportation, Highways Division for Field Office, Staging and work Area Purposes Covering Tax Map Key: (4) 4-1-3:17, Located at Kawaihau, Kaua'i.

The purpose of the amendment is to (A) the correct name of grantee "Hawaiian Telcom Inc." (without comma) to "Hawaiian Telcom, Inc." (with comma); and (B) rescind the Board's prior actions: (i) cancelling Revocable Permit No. S-7444 covering Tax Map Key: (4) 4-1-003:017, and (ii) issuing a new revocable permit to the Department of Transportation, Highways Division.

Item D-5 Set Aside to the County of Hawai'i, Department of Public Works for Roadway Purposes, Pi'ihonua, South Hilo, Hawai'i, Tax Map Keys: (3) 2-3-030:002 por., 2-3-031:005 por. & 006 por.; and

Issuance of an Immediate Construction and Management Right-of-Entry to the County of Hawai'i, Department of Public Works, Pi'ihonua, South Hilo, Hawai'i, Tax Map Keys: (3) 2-3-030:002 and 2-3-031:005 & 006.

Item D-6 Set Aside of State Land to County of Hawai'i for Public Park Purposes, Kaiwiki Homesteads, Kaiwiki, South Hilo, Hawai'i, Tax Map Key: (3) 2-6-010:016.

Item D-11 Grant of Term, Non-Exclusive Easement to Nanaina 'O Pali Ku, LLC for Seawall and Landscaped Area Purposes; He'eia, Ko'olaupoko, O'ahu, Tax Map Key: (1) 4-6-001: Seaward of 019.

Item J-1 Approval of Request for Contested Case Hearing by Mr. Stephen E.J. Koehne, Regarding November 9, 2017 Enforcement Action for Alleged Illegal Commercial Activity, In Violation of Hawai'i Administrative Rule § 13-256-39(B)(5).

Item J-3 Consent to Sublease Harbor Lease No. H-83-2, Kona Marine Holdings, LLC., A Delaware Limited Liability Company, Lessee, to Jack's Diving Locker, a Hawai'i Partnership, Honokohau Small Boat Harbor, Kailua-Kona, Hawai'i, Tax Map Key: (3) 7-04-008:040 (Portion).

Kevin Moore noted that Land Division needed to make an amendment to Item D-11. Per the AG they need to delete request for administrative cost recovery.

Board Discussion-None

Public Testimony-None

Amendment to Item D-11:
In the RECOMMENDATION section, delete Item 2, assess a non-refundable administrative cost of $500, under Section 171-6, HRS.

Motion
Approve Items D-3, D-5, D-6, C-1, J-1 and J-3 as submitted, approve Item D-11 as amended (Gon/Oi). Unanimous.

Motion to adjourn (Gomes, Gon). Unanimous.

There being no further business, Chairperson Suzanne Case adjourned the meeting at 5:31 pm. Recording(s) of the meeting and all written testimonies submitted at the meeting are filed in the Chairperson's Office and available for review. Certain Items on the agenda were taken out of sequence to accommodate applicants or interest parties present.

Respectfully submitted,

Darlene S. Ferreira
Land Board Secretary

Approved for submittal:

Suzanne D. Case
Chairperson
Department of Land & Natural Resources

THE BOARD APPROVED
THE MINUTES AT ITS
MEETING HELD ON
APRIL 26, 2019

MINUTES
FOR THE MEETING OF THE
BOARD OF LAND AND NATURAL RESOURCES

DATE: FRIDAY, December 14, 2018
TIME: **9:15 A.M.**
PLACE: KALANIMOKU BUILDING
LAND BOARD CONFERENCE ROOM 132
1151 PUNCHBOWL STREET
HONOLULU, HAWAI'I 96813

MEMBERS

Suzanne Case
Tommy Oi
Stan Roehrig
Jimmy Gomes
Chris Yuen
Keone Downing

STAFF

Kevin Moore-Land
Curt Cottrell-Parks
Emma Yuen-DOFAW
Blue Kanahele-Land
David Smith-DOFAW

OTHERS

Linda Chow/AG
Davis Yogi/DOT-HAR
Kahlua Lio/C1
Norman Uchida/D13
Wally Ito/D9
Anne Frederick/D13
Pua Rossi-Fukino/D13
Shawn Shimabukuo/D13
Bridget Hammerquist/D13
Hope Kallai/D13
Kip Goodwin/D13
Sharon Goodwin/D13
George Antonelli/D9
Alan Murakami/D9
Norman Uchida/D13
Kenneth Ho/D9
Jason Hine/D9
Abby Lareau/DOT-AIR
Dre Kalili-DOT-HAR
Adam Laeha/C1, C3
Michelle Galim?/D13
Kevin Chang/D9
Malia Chun/D13
Haunani Rossi/D13
Jodi Malinoski/D13
Debbie Jackson/D13
David Bissell/D13
Aaron Murata/D9
Douglas Correa/D9
Michael K. Lee/D9
Yvonne Izu/D9,13
James Manaku/D9, 13
David Minkin/D9
Scott Enright/D13

Haunani Ross/D13

Chair Case called the meeting order at 9:24 a.m. Member Gomes read the Contested Case Hearing statement. Chair Case noted that Item D-7 has been withdrawn from the agenda.

ITEM M-18 Temporary Revocable Permit until March 2019 to Pacific Shipyards International, LLC, for Office Space and Parking Stalls, situated at Ferry Terminal Building, Pier 19, Honolulu Harbor, Tax Map Key: (1) 1-5-39:63 (Portion).

ITEM M-19 Issuance of a right of Entry to APEX, Legendary Features Productions US, LLC, at Pier 19 Terminal, Honolulu Harbor, Oahu, Tax Map Key: (1) 1-5-039: Portion of 7.

Davis Yogi and Dre Kalili, DOT-Harbors presented Items M-18 and M-19.

Board Discussion- None

Public Testimony-None

MOTION
Approved as submitted Items M-18 and M-19 (Gomes, Oi) unanimous.

ITEM M-1 Issuance of a Revocable Permit for a T-Hangar for Storage and Maintenance of Aircraft, Bruce and Carlene Mayes, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-076: Portion of 21.

ITEM M-2 Issuance of a Revocable Permit for Installation of ADS-B Radio Equipment to Support the Operation of the U.S. Federal Aviation Administration Air Traffic Control Tower, Harris Corporation, Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-72: 5 (Portion).

ITEM M-3 Issuance of a Revocable Permit for Passenger Check-In, Administrative Offices and Storage Space, Japan Airlines Co., Ltd., Daniel K. Inouye International Airport, Tax Map Keys: (1) 1-1-003: 051 (Portion), (1) 1-1-003:55 (Portion), (1)1-1-003:57 (Portion) and (1) 1-1-003: 058 (Portion).

ITEM M-4 Issuance of a Revocable Permit for Storage of Ground Service Equipment for Airline Operations, Southwest Airlines Co., Daniel K. Inouye International Airport, Tax Map Key: (1) 1-1-76: Portion of 21.

ITEM M-5 Issuance of a Revocable Permit for Space to Operate and Maintain Airborne Dispersant Delivery System, State of Hawai'i, Department of Health, Hazard Evaluation and Emergency Response Office, Kalaeloa Airport, Tax Map Key: (1) 9-1-13: 105.

ITEM M-6 Issuance of a Revocable Permit for the Installation of ADS-B Radio Equipment to Support the Operation of the U.S. Federal Aviation

Administration Air Traffic Control Tower, Harris Corporation, Kawaihāpai Airfield, Waialua, Hawai'i, Tax Map Keys: (1) 6-08-14:23 (Portion).

ITEM M-7 Issuance of a Revocable Permit for Aircraft Parking, Raja Segaran, Kawaihāpai Airfield, Waialua, Hawai'i, Tax Map Key: (1) 6-08-14:001 (Portion).

ITEM M-8 Issuance of a Revocable Permit for a T-Hangar for Storage and Maintenance of Aircraft, Randy Pacheco and Reno Soverns, Kawaihāpai Airfield, Waialua, Hawai'i, Tax Map Keys: (1) 6-08-14:001 (Portion) and (1) 6-08-014:018 (Portion).

ITEM M-9 Issuance of a Revocable Permit for Parking and Storage of its Mobile Mechanic Equipment, Aerosleek, LLC, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-10 Issuance of a Revocable Permit for Main Terminal Ticket Counter, Ticket and Baggage Offices, and Gate House for Airline Operations, American Airlines, Inc., Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-11 Issuance of a Revocable Permit, for Cargo Area Ramp Space for a Sorter Unit, Federal Express Corporation, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-12 Issuance of a Revocable Permit for Parking Stalls for Air Cargo Operations, Federal Express Corporation, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-13 Issuance of a Revocable Permit for Ramp Space for Business Operations Equipment, Flying Food Group, LLC, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-14 Issuance of a Revocable Permit for Parking and Storage of Rental Car Vehicles, The Hertz Corporation DBA Hertz, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 32.

ITEM M-15 Issuance of a Revocable Permit for Terminal Service Counter and Office Space for Greeter's Station and Passenger Lounge, Hualalai Investors, LLC, DBA Four Seasons at Historic Ka'upulehu, Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-16 Issuance of a Revocable Permit for Office Space for Greeter Operations in The Old Koa Rental Car Building, MC&A, Inc., Ellison Onizuka Kona International Airport at Keāhole, Tax Map Key: (3) 7-3-43: Portion of 40.

ITEM M-17 Issuance of a Revocable Permit for Airline Operations and Vehicle Parking at the Commuter Terminal and for Aircraft Tie-Down Parking, Schuman Aviation Company Ltd., at Līhu'e Airport, Tax Map Key: (4) 3-5-001: Portion of 8.

Abby Lareau, DOT-Airports, presented Items M-1 through M-17.

Board Discussion
Member Downing asked about items the Board had questioned previously. Lareau did not know the answers. Member Oi asked if the Board would be seeing renewals of DOT Revocable Permits. Deputy AG Chow was not sure if they needed to be brought back to the Board annually when continued. Chair Case mentioned that the DOT's position is that they do not need to be brought back to the Board when renewed.

Member Roehrig was concerned that RP's become like long-term leases when continually renewed. Lareau said many RP's are for small spaces like airport parking.

Member Oi asked about Ualena Street. Lareau said that most of Ualena Street is on long-term leases. Member Yuen commented on the Hawaii Freight Forwarders RP issue.

Public Testimony-None

MOTION
ITEMS M-1 through M-17, Approved as submitted (Gomes, Roehrig) unanimous.

ITEM D-9 Grant of Perpetual, Non-Exclusive Easement to Haseko (Ewa), Inc. for Drainage Purposes and Issuance of Construction Right-of-Entry Permit, Ewa, Oahu, Tax Map Keys: (1) 9-1-011: seaward of 007 and (1) 9-1-134: seaward of 006.

Kevin Moore, Land Division, presented the submittal.

Board Discussion
Member Downing stated he had been against lowering the berm and asked why the flood waters were not diverted into the Haseko lagoon. Yvonne Izu, representing Haseko, explained the problem with crossing the sewer outfall pipe. Member Downing said the purpose of the project was to allow more development. Izu said that Haseko could proceed without the project but that UH and DHHL would have some lands freed up with the project. Member Oi said he didn't think they needed to lower the berm; they could cut it down in an emergency.

Member Yuen commented if there was no flood, lowering the berm wouldn't change anything. Member Downing asked about sea level rise; he was concerned that lowering the berm would allow the sea into the area. Chair Case asked why the project couldn't wait until court appeals had been completed.

Public Testimony

Wally Ito, representing Kua 'Aina Ulu 'Auamo (KUA). Opposed the request. Showed photos of Ewa Beach limu, past and present, and discussed decline of limu.

Douglas Correa, Ewa Beach resident, testified against the application. Described how discharge from a drainage channel near Aikahi Place killed marine life.

James K. Manaku, Sr., opposed lowering the berm. Discussed his rights as a native Hawaiian.

George Antonelli, retired NOAA scientist. Opposed lowering the berm.

Douglas Correa, asked for a contested case hearing. Member Roehrig suggested that he wait. Chair Case explained that if granted this would stop the public testimony. Correa said he could not wait because he had to leave the meeting. Indicated that he wanted a contested case if the Board approved the project.

Member Yuen made a motion to go into executive session to discuss legal issues. Member Downing second the motion. Unanimous.

10:55 am: Executive Session

11:08 am: Back in Session

Member Yuen made the motion to deny contested case hearing request. Member Roehrig second the motion. Unanimous.

Michael K. Lee, spoke in favor of Haseko's proposal because of UH and DHHL. Said he had been given standing in the 2012 contested case hearing. Suggested scrubbers for pollutants, a supplemental EIS, and bringing all parties together. Mentioned a contested case hearing request if these three stipulations were not included but was not requesting one at this time.

Kenneth Ho, representing God's Country Waimanalo and Waimanalo Limu Huli. Supported Uncle Henry Chang Wo in opposing the project. Concerned about silt and toxins on limu.

Kevin Chang, representing KUA. Said that Uncle Henry had asked on his deathbed for Kua Aina to take over the opposition to the project. Questioned whether limu would be safe to eat.

Alan Murakami, representing Native Hawaiian Legal Corp. and KUA. Stressed burden of proof to establish absence of harm and the precautionary principle. Member Yuen said that he wished that KUA had been allowed to intervene. But there were findings of fact and conclusions of law, after a contested case hearing, that the project would not cause harm. It would allow water to flow into the ocean once in ten years rather than once in

twenty years, for a few hours. One day of runoff going into open ocean waters is not going to cause toxins to be accumulated in limu that will hurt people.

Member Downing recounted his experience of seeing marine life killed in Wailupe by freshwater runoff.

Member Yuen said his comments were re accumulation of toxins. Regarding fresh water runoff, this depends upon the situation, how long marine life is in contact with fresh water; it was covered at the contested case hearing.

Member Roehrig moved to deny based on Article XI, Sec. 7 of the state constitution, citing damage to trust rights in gathering limu, and because of the precautionary principle. Can only see this allowed if there was an emergency proclamation by the Governor.

Member Downing commented that it was best to avoid letting runoff go into the ocean. Member Oi commented that there were alternatives; that the County could lower the berm in an emergency. Member Gomes said he agreed with Ito and Murakami, that we should protect resources.

Yvonne Izu said it was not proper to relitigate the issues decided in the contested case hearing today.

Chair Case commented that if we denied now, they could apply again. This would be like a deferral. Member Downing commented this was a balance between development and resources. Chair Case said she would vote in favor of the motion because the easement was premature.

MOTION
Denied (Roehrig, Gomes) vote 6-1 in favor the motion; Yuen voted no.

12:23 pm: Break for Lunch
1:10 pm: Back in Session

ITEM D-13 Holdover of Revocable Permits for Water Use on the Islands of Hawaii and Kauai. See Exhibit 3 for list of Revocable Permits.

Note, RP 7234 is WITHDRAWN

Blue Kanahele, Land Division, presented the submittal. Noted that there is a correction on page 7of the submittal. The 7.4/mgd figure is incorrect. It should be 8.0/mgd due to differences at where this is measured. The division has been working closely with DHHL and others. It will present the watershed management plans to the Board at the end of January. Have also been working closely with the permittees.

Board Discussion
The Board started with RP 7340, KIUC.

David Minkin, Attorney for KIUC, and *David Bissell*, CEO, provided information through a PowerPoint presentation. This diversion produces 1.5 MW of renewable energy. It is the lowest cost energy produced by KIUC, saves the Kauai customers $1.75 million/yr., and saves 675,000 gallons per year of diesel.

Jason Hine, explained compliance with the Board's three conditions on the previous RP. Showed slides of the changes to the diversions that restored some flow to Wai'ale'ale and Waikoko.

Discussed contacts regarding Watershed Management Plan and with DHHL. Explained increased measuring of flow.

Bissell, noted that hydro is 24/7 renewable power. Accepted the balance between energy and stream restoration represented by the staff submittal.

Public Testimony
Scott Enright, Chair of Department of Agriculture, supported RP 7340. The diverted water supports many downstream agricultural users.

Anne Frederick, Executive Director of Hawaii Alliance for Progressive Action (HAPA). Opposed RP 7340 because of the Public Trust Doctrine. Questioned how much water KIUC needed. Said there should be an equitable sharing of water with KIUC.

Malia Chun, discussed cultural significance of Wai'ale'ale and habitat. Against holdover of RP 7340.

Pua Fukino, whose father has a farm in the lower Wailua area. Was told that there was an auwai, but it is now dry.

Hauanani Ross. Discussed Hawaiian customs regarding water, opposes RP 7340.

Sean Shimabukuro, representing Grove Farm. In favor of this RP because of energy needs. Grove Farm uses water after it is released to the S. Fork of Wailua, for public drinking water, ag, and other uses. Their water treatment facility serves 15,000 people.

Kip Goodwin, representing Kauai Group of Sierra Club. Opposed RP 7340. Wanted more studies.

Jodi Malinowski, Sierra Club Hawaii policy advocate, opposed holdover of RP 7340. Questioned whether KIUC needs the water. Sierra Club supports renewable energy but not this diversion.

Bridget Hammerquist, representing Kiai Wai o Wai'ale'ale. Criticized the 100' of dry stream remaining even after KIUC implemented changes to the diversion. Wanted to find out what KIUC really needs. Said that the figure given by their group's written testimony

was wrong because they used the wrong figure for the head. Opposed the holdover of RP 7340.

Hope Kallai. This is a consumptive use of water. Wanted more studies.

Sharon Goodwin. These are public access streams. Complained about rebar at the diversions.

James K. Manaku, Sr. KIUC should disclose how this affects 'opae, o'opu, and hihiwai.

Allen Smith. Retired from Lihue Plantation and Grove Farm, currently board chair of KIUC. These power plants are important to KIUC.

Puanani Rogers. Has been arrested acting as a cultural practitioner. Opposed RP 7340.

Chair Case disclosed that Steve Case, president of Grove Farm, is her first cousin, but she has no financial interest in this matter and will not recuse herself.

Summer Kauakahi. Wanted more water to flow naturally. Recounted legend of Pihanakalani.

Leinaala Ley, representing Earthjustice. Said there is not enough information to show that this meets with the public trust. There are other streams that feed the hydro plants.

Sean Stagner, representing Hawaii Backcountry Adventures. They give inner tube rides through the irrigation ditches downstream of the hydro plants. They have 100 employees who depend on this water; low water would put this activity at risk.

Bianca Isaki, consultant with Kiai Wai o Wai'ale'ale. Asked for recusal of Member Oi.

KIUC Presentation:
Dr. James Parkham, Consultant for KIUC. Has done biological work on streams in Hawaii for 20 years. Works with Division of Aquatic Resources on these stream issues. Looked at Wailua system for KIUC. Showed video of life in the streams. Lots of o'opu in the North and South Forks of Wailua below the major waterfalls. None above the waterfall in the North Fork because of introduced smallmouth bass, despite this being very good habitat otherwise. Lots of 'opae above the diversions, even in the diversion tunnels.

Returning more water to the North Fork will not result in o'opu returning because the smallmouth bass will get into the same areas. Did not find any Newcomb's snails. The streams below the diversions are not good snail habitat; they prefer springs rather than running streams.

Member Yuen asked if we restored flows would the smallmouth bass get into places that they can't now. Parkham said yes, they are in diversions on the South Fork. The North Fork is not as good habitat for them.

Member Roehrig asked how KIUC could get a contested case hearing in the IIFS. Brad Rockwell said they are in mediation. Member Roehrig asked what are KIUC's plans to return more water to the state lands. Rockwell said that some of the water goes to state land after going through the hydro plants.
Member Yuen asked Pua Fukino about her father's farm. After some discussion it was determined that this farm is not affected by the diversions in question. Member Oi stated that this is a different area where people diverted a different stream.

Member Downing asked about KIUC's maintenance. Bissell said that KIUC has spent hundreds of thousands of dollars on studies and maintenance and has applied to the State for permits for repairs.

In response to a question about how much water KIUC needed, Rockwell replied that we need 25/mgd to run the system at 1.5 mw.

Member Roehrig asked about financial arrangements with Grove Farm. Bissell says they pay no money to Grove Farm for the water diverted from streams arising on Grove Farm land, or for the use of the system.

Member Yuen commented that according to the staff submittal, each 1/mgd generates 4-5% of the total power. There's a tradeoff between leaving water in the stream and generating power.

Bissell said that they keep getting asked by Earthjustice at what point of reduction in stream flow KIUC would stop producing power. Member Roehrig asked what their actual needs were to produce full power. KIUC answered 25/mgd.

Chair Case said that the IIFS process has been successful in Maui cases and in Koke'e/Waimea. These RP's are temporary, but we are on track to convert to lease applications. Staff came up with a solid proposal for this year's RP.

Member Roehrig said that the CWRM proposal is a good starting point and suggested a working group. Member Downing encouraged compromise.

Member Oi recused himself from voting.

Member Yuen made a motion to approve, with an amendment that KIUC enter facilitated discussions. Seconded by Roehrig.

There was some discussion re what groups should be invited, but Earthjustice, Kiai Wai o Wai'ale'ale, Sierra Club, Grove Farm, and DHHL were specifically mentioned. The basic direction was to be inclusive. There should be a report back in three months.

Member Yuen said that the proposed RP is consistent with the Public Trust Doctrine. The hydro would save 6900 tons of CO2 from going into the atmosphere. The diversions don't

affect any taro growers. The lower reaches of Wailua Stream have lots of water. All DHHL lands are near the South Fork of Wailua, not the North Fork. The IIFS recommended figure is consistent with the amounts recommended for habitat preservation in other cases. But in this these streams, there may not be ecological benefits from restoring stream flow because of the bass. Just having water in the stream is a benefit. Showed pictures of Wai'ale'ale Stream below the diversion, with 4/mgd, given to him by CWRM staff. The stream has rapids, small waterfalls, the visual aspect of a nice stream. And there is no practical alternative to make up for the loss of this stream water for the hydro plants.

Amendment:

1. ***The holdover of Revocable Permit No. S-7340 to Kauai Island Utility Cooperative ("KIUC"), as amended. The Board included a condition that KIUC is to invite Earthjustice, Kia´i Wai O Wai´ale´ale, Sierra Club, Grove Farm, and the Department of Hawaiian Home Lands (together, the "Working Group"), to participate in a facilitated discussion regarding their respective positions on KIUC's request to use State water for its hydroelectricity plants in the permit area, as well as any other relevant matters they choose to discuss. The Working Group may invite other individuals or organizations to participate in the discussion. KIUC shall report back to the Board on the progress of the discussions in three months.***

MOTION
Approved as amended (Yuen, Roehrig) unanimous.
Member Oi recused.

ITEM C-1 Request approval of the Kahula Lio Farm Forest Stewardship Management Plan and Forest Stewardship Agreement with Sean Martin, TMK (1) 4-7-007:009 portion, Ko'olaupoko, Island of O'ahu

and

Request approval of Declaration of Exemption to Chapter 343, Hawaii Revised Statutes for the project.

ITEM C-2 Request approval of the Shlachter Forest Stewardship Management Plan and Forest Stewardship Agreement with Marc Shlachter, TMK (3) 1-1-027:011, (3) 1-1-027:012, and (3) 1-1-027:013, Puna, Island of Hawai'i

and

Request approval of Declaration of Exemption to Chapter 343, Hawaii Revised Statutes for the project.

ITEM C-3 Request approval of the Kaalaea Koa Farm Forest Stewardship Management Plan and Forest Stewardship Agreement with Stephanie Loui and Steven Loui, TMK (1) 4-7-007:009 portion, Ko'olaupoko, Island of O'ahu

and

Request approval of Declaration of Exemption to Chapter 343, Hawaii Revised Statutes for the project.

ITEM C-4 Request for approval to enter into a 2-year contract with the Zoological Society of San Diego to provide services to operate the endangered bird captive propagation facility on Maui, the Maui Bird Conservation Center, and to provide expert avicultural services to conduct related forest bird propagation projects at the Keauhou Bird Conservation Center on the Island of Hawaii and throughout the State

and

Request approval of Declaration of Exemption to Chapter 343, HRS environmental compliance requirements for the project.

ITEM C-5 Request approval to renew a Memorandum of Understanding (MOU) between the United States Department of the Interior, National Park Service, the State of Hawaii, Department of Land and Natural Resources, and the County of Hawaii for management of the Ala Kahakai National Historic Trail.

ITEM C-6 Request for approval to enter into a multi-year contract with Trailhead Labs, Inc. to build, deploy, and maintain two mobile applications, one for the State of Hawaii hunting program and one for the trails and access program.

and

Request approval of Declaration of Exemption to Chapter 343, HRS environmental compliance requirements for the project.

David Smith, DOFAW, present to answer any question for Items C-1 through C-6.

Board Discussion-None

Public Testimony-None

MOTION
Approve submittal Items C-1 though C-6 (Oi, Roehrig) unanimous.

ITEM D-2 Grant of Term, Non-Exclusive Easement to Konohiki Kihapai LLC for Access and Utility Purposes; Issuance of Immediate Management Right-of-Entry Permit, Portions of Waipouli & North Olohena, Kapaa Homesteads, 2nd Series, Kapaa, Kauai, Tax Map Keys: (4) 4-4-006: portions of 012 and 013.

ITEM D-5 Issuance of Right-of-Entry Permit to Hawaii Surfing Association, for Event Operations Purposes Related to the 2019 Hawaii Surfing Association Honolua Legends of the Bay Amateur Surfing Contest on January 12 – 13, 2019, at Honolua, Lahaina, Maui, Tax Map Key: (2) 4-1-001: Portion of 010.

ITEM D-6 Withdrawal of a Portion of State Lands from Governor's Executive Order No. 3708 issued to the Department of Transportation, Harbors Division and a Reset-Aside to the Department of Land and Natural Resources, Division of Boating and Ocean Recreation (DOBOR) for Public Purposes. Issuance of an Immediate Management Right-of-Entry to DOBOR, Kalihi-Kai, Honolulu, Oahu, Tax Map Key Numbers: (1) 1-2-023: 053, 057, 054, 037 and 059. Grant of Perpetual Non-Exclusive Easement to DOBOR for Roadway Access Purposes, Kalihi-Kai, Honolulu, Oahu, Tax Map Key Number: (1) 1-2-023:033 (portion).

ITEM D-8 Issuance of Right-of-Entry Permit to Hawaii Explosives & Pyrotechnics, Inc. for Aerial Fireworks Displays on December 31, 2018, at Duke Kahanamoku Lagoon; Waikiki, Honolulu, Oahu, Tax Map Key: (1) 2-3-037:021 (Portion), at the beach fronting the Kahala Hotel, Waialae, Honolulu, Oahu, Tax Map Key: (1) 3-5-023:041, and on Unencumbered State lands off Ko Olina Beach, Honouliuli, Ewa, Oahu, Tax Map Key: (1) 9-1-057:seaward of 006.

ITEM D-10 Request to Amend Prior Board Action of June 22, 2018, (Item D-9):

Request to Amend the Board's Prior Approvals for the Setting-Aside of State Lands Located at the Pearl City Educational Complex to the Department of Education to Serve Public School Purposes.

The purpose of this submittal is to amend the following Board Actions of: February 14, 1969 (Item F-11), "Amend Board Action of August 23, 1968 Relating to Set-Aside of Lands of Waimano to Department of Education".

Issuance of an Immediate Right-of-Entry to the Department of Education and to the Department of Health; Waimano-Uka, Ewa, Oahu, Tax Map Key: (1) 9-7-025: 004.

The purposes of this amendment are to: (a) rescind the Board's approval of a request to withdraw a triangular-shaped piece of land that was previously understood to be encumbered under Executive Order Number 2273; and (b) approve the withdrawal of State lands from Governor's Executive Order

Number 1020, to be reset-aside to the Department of Education, as shown on C.S.F. Map 15,692.

ITEM D-12 Amend Prior Board Action of September 22, 2017, Item D-7, *Grant of Term, Non-Exclusive Easement to Seaview 2004, Inc. for Resolution of Encroaching Seawall Purposes, Spreckelsville, Wailuku, Maui, Tax Map Key: (2) 3-8-002: seaward of 001.*

The purpose of amending the Board's September 22, 2017 action is to increase the area of the easement from 1,128 square feet to 2,206 square feet.

Board Discussion-None

Public Testimony-None

MOTION
Approved Items D-2, D5, D-6, D-8, D-10 and D-12 (Gomes, Oi) unanimous.

ITEM D-13 CONTINUATION:
Blue Kanahele, Land Division, restated the submittal.

Holdover of remaining permittees on Kauai (other than KIUC) and Hawaii Island. (RP's 7054, 7088, 7267, 7310, 7426, 7432, and 7463).

Norman Uchida, Director of Generating Division for HELCO, gave information about their progress toward a lease. They had major damage from Hurricane Lane to the Waiau hydro-power plant. The PUC will require a lease before approving major repairs to the plant.

Board Discussion
Roehrig asked Uchida if anyone else wanted to bid on the lease. Uchida, replied not that he knows of?

Public Testimony-None

MOTION
Approve Revocable Permit No. S-7462 to Hawaii Electric Light Co., Inc., Approve the holdover of the remaining water permits on the Islands of Hawaii and Kauai, except for Revocable Permit No. S-7234 to Wood Valley Water and Farm Cooperative ("Wood Valley"). (Roehrig, Gomes) unanimous.

ITEM D-3 Report to Board on Status of Revocable Permit No. S-7867; Cancellation of Revocable Permit No. S-7867, Association of Apartment Owners of Country

Club Hawaii, Inc., and Issuance of Month-to-Month Revocable Permit to OceanFront 121 Inc., for Apartment and Hotel purposes, Banyan Drive, Waiakea, South Hilo, Hawaii; Tax Map Key: (3) 2-1-005:020.

Kevin Moore, Land Division. He apologized for not bringing it to the Board in the requested time frame. The former AOAO of Country Club has created a new entity "OceanFront 121" will become the new permittee. The shareholders of the new entity would be the people who had "Possession Agreements" for the units. Because the paperwork to create the new entity had not yet been completed, Land Division was proposing to continue the RP with the same entity, with a 3% rent increase. Noted that "Possession Agreements" were no longer valid.

Board Discussion
Yuen noted that OceanFront 121 would receive the rents and put it back into the building and wanted to know who was part of Ocean 121? Moore replied it was the 55 shareholders.

Roehrig said the agreements look like time-shares which would be a sub-lease. The State should get a premium if they are charging a flat amount to the entity.

Case commented that any "Possession Agreements" recorded at the BOC should be released.

There was a robust discussion regarding base rent and percentages. Roehrig asked the Deputy AG to clarify and advise.

Public Testimony-None

Amendment:

Staff to request the advice of the Department of the Attorney General as to whether it is permissible for the State to charge a base rent plus a percentage of permittee's net revenue, as opposed to gross revenue. Staff is to report back to the Board on the response from the Department of the Attorney General.

MOTION
Approved as amended (Roehrig, Yuen) unanimous.

ITEM D-1 Annual Renewal of Revocable Permits on the Island of Kauai. See Exhibit 2 for list of Revocable Permits.

Wesley Matsunaga, Land Division presented the submittal. He noted that he plans on working with the RP holders to convert to long-term dispositions. Approximately 80% may be suitable.

Board Discussion

The discussed how the Division came up with the percentages and why some were higher than others. Matsunaga noted that the justifications are in the comment section of the submittal.

Public Testimony-None

MOTION
Approved as submitted (Gomes, Roehrig) unanimous.

ITEM E- 2 Approval to Continue Twenty (20) Revocable Permits for Use of State Parks Lands on the Islands of Kaua'i, O'ahu, Maui, and Hawai'i for the following: Kaua'i: Na Pali Kayak Inc., Kayak Kaua'i, a Hawai'i Limited Partnership, Rick Haviland, dba Outfitters Kauai (Napali Coast State Wilderness Park for Commercial Kayak Landings), Clancy Greff dba Na Pali Eco Adventures, Inc, Na Pali Sea Tours, Inc., Lady Ann Cruises Inc., (Napali Coast State Wilderness Park for Inflatable Boat Landings), Ka Imi Naauao o Hawai'i Nei Institute, Kaua'i Christian Fellowship, (Waimea Canyon State Park Non-profit Recreation-Residences/Camps), Hawai'i Conference Foundation (Koke'e State Park non-profit camp), O'ahu: Diamond Parking Services, LLC (Nu'uanu-Pali State Wayside, Parking Concession), Bottling Group, LLC (Diamond Head State Monument beverage vending), Erlinda Molina Villanueva (Ahupua'a O Kahana State Park, Agricultural use), Young Men's Christian Association of Honolulu, Hawai'i Climbing Coalition, (Ka'ena Point State Park, Outdoor Recreational Activities), Maui: Republic Parking Northwest, Inc. ('Iao Valley SM, Parking Concession), Hawai'i: Republic Parking Northwest, Inc. (Hāpuna Beach SRA, Parking Concession), Diamond Parking Services, LLC (Akaka Falls State Park, Parking Concession), Adventures in Paradise, Inc., Kona Boys, Inc., Iwa Kalua (Kealakekua Bay State Historical Park, Commercial Kayak Tours). See attached Exhibit A for a list of Revocable Permits.

Curt Cottrell, State Parks. He amended the submittal to add the Exhibit for Exemption of Notification, Exhibit B, which he handed out. He was available to answer any questions.

Board Discussion- None

Public Notice- None

MOTION
Approved as submitted (Oi, Roehrig) unanimous.

There being no further business, Chairperson Suzanne Case adjourned the meeting at 5:45 p.m. Recording(s) of the meeting and all written testimonies submitted at the meeting are filed in the Chairperson's Office and available for review. Certain Items on the agenda were taken out of sequence to accommodate applicants or interest parties present.

Respectfully submitted,

Darlene S. Ferreira
Land Board Secretary

Approved for submittal:

Suzanne D. Case
Chairperson
Department of Land & Natural Resources

Kaua`i Island Utility Cooperative
Your Touchstone Energy® Cooperative

March 15, 2019

Ms .Suzanne Case, Chair
Board of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl St.
Honolulu, HI 96813

Re: Revocable Permit No. S-7340, Report on Facilitated Discussions

Dear Chair Case:

Pursuant to the Board's request on December 14, 2018, attached herewith is a report on activities that have been undertaken to effectuate facilitated discussions among interested parties regarding the subject permit.

The report has been authored by Mr. Robbie Alm, who was engaged as a volunteer facilitator to lead the discussions.

We would be happy to respond to any questions you may have regarding the report.

Mahalo,

David Bissell
President and Chief Executive Officer

Enc: Report on the Facilitated Discussion

REPORT ON THE FACILITATED DISCUSSION
KAUAI ISLAND UTILITY COOPERATIVE (KIUC) REVOCABLE PERMIT S-7340

At its December 14, 2018 meeting, the Board of Land and Natural Resources approved a revocable permit for KIUC with the following in its minutes:

> Holdover of Revocable Permits for Water Use on the Islands of Hawaii and Kauai. See Exhibit 3 for list of Revocable Permits. APPROVED AS AMENDED. The Board considered the holdover requests for the Hawaii and Kauai water revocable permits in three phases. First, the Board approved the holdover of Revocable Permit No. S-7340 to Kauai Island Utility Cooperative ("KIUC") as amended. The Board included a condition that KIUC is to invite Earthjustice, Kia'I Wai O Wai'ale'ale, Sierra Club, Grove Farm and the Department of Hawaiian Home Lands (together "The Working Group"), to participate ibn a facilitated discussion regarding their respective positions on KIUC's request to use State water for its hydroelectric plants in the permit area as well as any other matters they choose to discuss. The Working Group may invite other individuals or organizations to participate in the discussion. KIUC shall report back to the Board on the progress of the discussions in three months.

KIUC approached the Collaborative Leaders Network (CLN) about facilitating these discussions. CLN agreed to undertake this work with the understanding that for the initial meetings CLN would cover any of its own costs in the spirit of encouraging collaborative problems solving.

The Discussions

Three meetings were held on Kauai between January and March,

The first meeting was held with all the parties named above and every party expressed their basic sense of the issues involved, how they would like to have this work proceed from a process standpoint, and who else should be part of the process. The Kia'I Wai O Wai'ale'ale, Sierra Club, Earthjustice, HAPA, and Department of Hawaiian Homelands specifically asked if they could meet separately from the others to discuss their concerns (The others were interested in continuing to meet together but deferred to this request).

The second meetings were, as requested, held separately. Joining the morning session was the Office of Hawaiian Affairs. In that session, there were concerns raised on the environmental review process being undertaken by KIUC, KIUC's adherence to the stream flow numbers set by the Board, the relationship between this process and the larger questions of water use in the region, the value of the two hydro plants involved to Kauai, the larger economic interests involved, how the water lease and IIFS processes will work together, as well as a discussion of the sacredness of the water in the two streams specifically at issue here and how (or if) that can be reconciled with the other uses of the streams. The group also asked that a set of specific questions that they wanted KIUC to answer.

In the afternoon session, Kauai County Managing Director Michael Dahilig, the Kauai County Planning Department, the Kauai Department of Water Supply, and Kauai Backcountry Adventures also joined the conversation. In that session there were concerns raised about making sure that all interests including agricultural and other community public purposes and recreational were included in the decision-making, that all of these water systems are interconnected and therefore making changes to one portion affects many others (cumulative impacts), that this area (Lihue) is the major area for the housing needs on Kauai in the 21st century and water decisions need to be made with that in mind, and that Grove Farm has accumulated a lot of knowledge about this system as well as maintained it for the benefit of the island. The group also believes that the interests of all of the parties are not mutually exclusive and would like to work together to come to an understanding.

In addition to these meetings, there were a number of conversations and emails, as well as numerous pages of prior correspondence, documents, photographs, and diagrams provided on the issues involved.

The third set of meetings looked at the messages that the parties wanted to convey to the Board about the handling of the issues in this case.

The Questions to KIUC

1. It is the view of the morning parties that the BLNR had ordered KIUC to release 1.6 MGD in the stream at Waikoko and 4.0 at Wai'ale'ale Stream. Are these amounts of water actually being released?

   KIUC believes that it is in compliance with the BLNR order.

   KIUC believes the amount required to be release at Waikoko is 0.8 MGD.

   (Both sides believe they have it right. There are a couple of ways to move forward on this one. One is to take this dispute to the Board and it will likely be sent to staff who will then report back to the Board on compliance. The other way is to have each side designate one person who will together review the situation including going up to the sites to make sure that they at least understand each other's views of this situation and hopefully agree on a shared understanding of what is going on or at a minimum narrow the dispute as much as possible.)

2. What specific environmental review process is KIUC undertaking in connection with this application.

   KIUC has been conducting an Environmental Assessment (EA) with the DLNR as the accepting agency. KIUC expects to complete it and submit it this month or as soon thereafter as possible.

3. How much water does KIUC need to operate the hydro plants at an efficient level?

   KIUC needs up to 25 MG in the upper forebay of the Upper Hydro and 42 MG in the lower forebay of the Lower Hydro.

   Additionally, there was a desire to know from where the waters for these amounts came from.

   For the Upper Hydro, KIUC uses water from these two streams (Wai‘ale‘ale and Waikoko), the Iliiliula diversion (located on Grove Farm land but operated by KIUC as part of the Iliiliula North Wailua Ditch System) and some small seasonal contributions during high rains. For the Lower Hydro, KIUC uses water diverted from Waiahi Stream (downstream of the tailrace discharge of the Upper Hydro), Iliiliula Stream and some small seasonal streams that contribute during high rains. The amount of water discharged into Waiahi Stream from the Upper Hydro tailrace directly impacts how much water is available for the Lower Hydro.

   The original Revocable Permit for Blue Hole and Waikoko diversions combined allowed up to an annual average of 14.2 MGD though through KIUC’s diversion history they have been taking more like 13 and under current orders are taking a combined about of 9.6 MGD unless stream flow is above median flows. Overall 50% to 65% of the water used come from the diversion of these two streams.

The Wisdom of the Groups

While there are clearly very divergent views on a significant number is issues, there were commonly held views that are worth setting forth.

First, all the waters in the Lihue region are interconnected and the combinations of streams and diversions/ditches has and continues to have a very significant impact on the environment of the area, the Native Hawaiian culture and its practices in the area, and the economy and quality of life in the area.

Second, there are very strong and divergent views about what the right answers are in terms of (1) the amount of water that needs to be left in the streams, (2) the continuation of total or substantial diversions of water anywhere in the system, and (3) the impact that any significant changes to the current water system will have on the overall social, economic and environmental health of the region.

Third, all parties agree that the Waikoko and Wai'ale'ale issues are just the start of a much broader and more complex conversation and processes about the Lihue region. There are likely to be many more disputes coming with greater and greater consequence to the people of Kauai.

Fourth, the way in which the BLNR's revocable permit/lease processes and the Water Commission's IIFS process will (or won't) work together in a coordinated matter is not at all clear to these parties. Any discussion has a tendency to get to both issues very quickly and in an overlapping manner.

Fifth, all parties agree that some form of formal dispute resolution would be better for Kauai as a community and would want to engage is such a process.

Sixth, all parties are concerned that the tone of the discussions sometimes assumes a level of animosity that is not good for Kauai overall and a process more conducive to community building is very much in Kauai's interest.

Specific Recommendation Based on the Discussions

There needs to be a formal process in which the parties can participate. That process can be a contested case process, a contested case process with a mediation effort at the outset or during it, or some other process, (The parties do believe that any exchange of information and views is useful, but at this stage a formal setting for those discussions and exchanges is critical.)

The most available starting point is the IIFS process at the Water Commission involving the Wai'ale'ale and Waikoko Streams in which a contested case has already been requested.

In the longer term, the issues in the region significantly overlap and intersect, and that as challenging as it may be, consideration needs to be given to having a process examine all of the streams and waters in the Lihue area if that can be done.

Finally as the State moves more and more into the IIFS and water lease processes, it would be helpful if there is as much transparency as possible in how the two processes will coordinate with each other.

APPENDIX B
IIFS and Production Impacts

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Instream Flow Standards

In Hawaii the Commission on Water Resource Management (CWRM) has the responsibility of setting Instream Flow Standards (IFS) on individual streams as needed in order to protect the public interest in the waters of the State. Through the instream flow standard process, CWRM has the role of weighing "the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses." (Code 174C-71(2)). The Code defines an instream flow standard as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses". (HAR 174C-3) An IFS is a volume of water which must remain in the stream at the point of diversion in order to meet the instream needs and the public trust needs. Instream uses generally include the following: maintenance of fish and wildlife habitats; outdoor recreational activities; maintenance of ecosystems such as estuaries, wetlands, and stream vegetation; aesthetic values such as waterfalls and scenic waterways; navigation; instream hydropower generation; maintenance of water quality; the conveyance of irrigation and domestic water supplies to downstream points of diversion; and the protection of traditional and customary Hawaiian rights. Noninstream uses generally refer to water diverted or removed from the stream channel for domestic, agricultural and industrial purposes. Public trusts purposes of water are as follows: water in its natural state; water for traditional and customary practices; water for domestic uses; and water for the Department of Hawaiian Home Lands. There are no priorities among the public trust purposes but they must be protected whenever feasible.

The current Interim Instream Flow Standard (IIFS) for streams on Kauai were established by way of Hawaii Administrative Rules (HAR) 13-169-48 became effective in December 1987 and read it part as follows:

> "Interim Instream flow standard for Kauai. The Interim Instream Flow Standard for all streams on Kauai, as adopted by the commission on water resource management on June 15th, 1988, shall be the amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard…."

CWRM staff initiated an assessment of hydrology, instream and noninstream uses in the Wailua watershed in 2016 and has approached addressing the IIFS for streams in the watershed in phases starting with the North Fork Wailua River and Waikoko Stream at the point of the North Fork and Waikoko diversions.

In August 2018, the Commission held their meeting on Kauai and the agenda included amending the Interim Instream Flow Standards for the Surface Water Hydrologic Unit of Wailua: North Fork Wailua and Waikoko Streams. The staff submittal for this meeting, a copy of

which is included in the appendices, included a proposed IFS for North Fork Wailua at the North Fork Diversion and Waikoko Stream at the Waikoko Diversion. The proposed IFS for North Fork Wailua approximately 500 yards below the Iliiliula North Wailua Ditch is 4.0 mgd, which represents 3.5 mgd of restoration at the diversion plus approximately 0.5 mgd in natural seepage gain. The location of the IFS is consistent with the location of a stream gage on the North Fork installed and operated by CWRM. The proposed IFS for Waikoko Stream at the diversion is 0.8 mgd[1]. The proposed IFS values are shown in the table below.

CWRM Diversion ID	Diversion Description	CWRM Recommended IIFS	Historic Diversion Volume Limitation (avg/yr)
716	North Fork Wailua	3.5 mgd (5.4 cfs) restoration	incl. in 713
713	Waikoko Stream	0.8 mgd (1.3 cfs)	14.1 MGD

Table 1 – Staff Recommended IIFS Quantities (source: CWRM)

Implications of the IIFS and Resultant Water Availability

There are no streamflow records for the North Fork Wailua River or Waikoko Stream in the vicinity of the diversion locations. However, accurate long-term measurement records exist for the Iliiliula North Wailua Ditch below the North Fork and Waikoko diversions as shown in Table 2.

USGS Gage ID	USGS Description	Period of Record	Mean Flow
16061000	North Wailua Ditch nr Lihue , Kauai	07/01/1932 to 09/29/1985	12.21 MGD (18.9 cfs)
16061200	N. Wailua Ditch blw Waikoko Str nr Lihue , Kauai	01/01/1965 to 09/29/2002	13.96 MGD (21.6 cfs)

Table 2 – USGS Ditch Flow Records (source: USGS)

Use of this ditch flow data to understand natural stream flow at the point of diversion is problematic because natural flows which are above ditch capacity pass over the diversion spillway and all leakage or sluiced flows which are not diverted are not recorded. On typical plantation style irrigation diversions the ditch invert (floor elevation) is well below the spillway crest (overflow section in the stream channel) in the interests of capturing as much water as possible for the farming operations during dry periods. For this reason, we can assume that the ditch flow records roughly represent natural streamflow during low flow periods, but do not reflect streamflow during moderate and high flow periods that were above the capacity of the ditch. In the case of the Iliiliula North Wailua Ditch, the hydraulic capacity is approximately 30 mgd (46.2 cfs). While diversion values have been recorded above that, experience indicates that diverted flows greater than 30 mgd cannot be transported through the ditch and will overtop the ditch shortly after the point of diversion. Diversion values recorded over 30 mgd are reflections of flood events that overtop the stream channel and ditch overflows in various places and do not reflect the ditch capacity.

[1] CWRM Staff Submittal – IIFS Recommendation Waikoko and North Fork Wailua Streams 08/21/18 pp 19-20

One of the most common tools for visualizing and understanding streamflow characteristics is a flow duration curve (FDC), which charts the percent of time that a given flow is exceeded. Figures 1 and 2 below show FDCs that were developed using USGS's period of record data for daily average flow at the gages listed in the Table above. The median flow is equal to 50% on the FDC (Q50). The IFS restoration value of 5.4 cfs is equal to about 97% on the FDC, meaning that 3% of the time there was less than the proposed IFS occurring naturally.

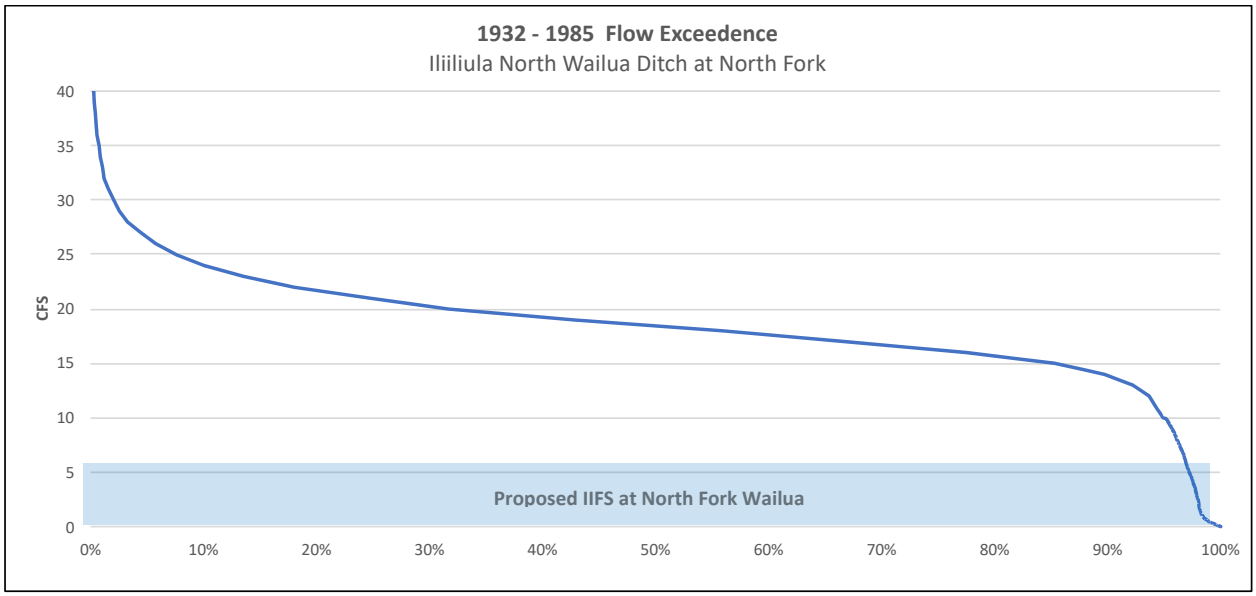

Figure 1 – Flow Exceedance at USGS 16061000 Ditch Gage (source: CWRM)

In the simplest terms we can use the FDC to determine the impact to available ditch flow. In essence, everything below the blue FDC plot line in Figure 1 represents water that was diverted during the period of record. The IFS can be represented graphically as a slice across the bottom of the FDC plot, as shown by the blue shaded area in the FDC above. Analysis of the USGS 16061000 *average* daily data shows that the IFS, if applied during the 1932 to 1985 period of record, would have resulted in as much as a 28% reduction in diverted water at the North Fork Wailua Diversion #716.

The overall appearance and characteristic of the Waikoko Gage 06061200 FDC (Figure 2 below) is similar to the North Fork Wailua ditch gage FDC with incrementally higher values due to the water added by Waikoko Stream. As is shown in Table 2 above, the average (mean) flow at the ditch gage below Waikoko is 2 cfs higher at 21 cfs versus 19 cfs, meaning an average of 2.7 cfs was added to the ditch from Waikoko Stream during the period of record. Analysis of the USGS 06061000 *average* daily data shows that the IFS, if applied during the 1965 to 2002 period of record, would have also resulted in as much as a 28% reduction in diverted water in the ditch below the Waikoko Stream Diversion #713.

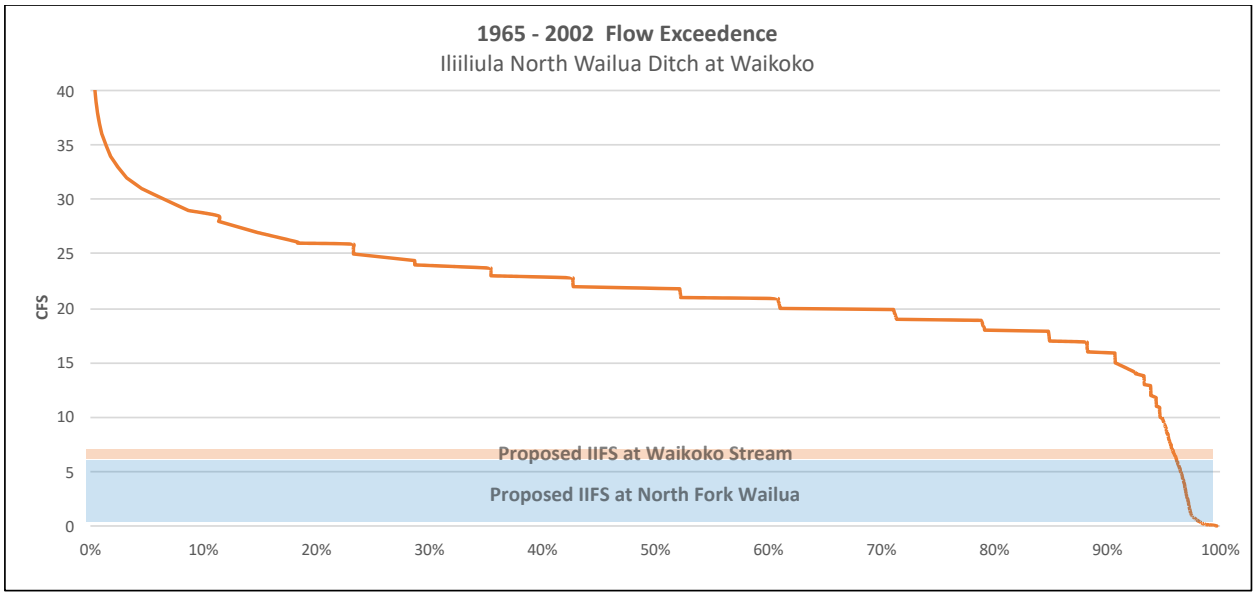

Figure 2 – Flow Exceedance at USGS 06061200 Ditch Gage (source: CWRM)

Proposed Implementation of the CWRM Staff Recommended IIFS

Accurate and reliable release of the IFS at the diversions is not possible with the legacy plantation diversion structures without structural and dimensional modifications. This is because they were designed to divert all stream flow during low flow periods.

KIUC is proposing to address IFS requirements in two steps, as follows:

1) Immediate partial restoration of flow within one year as requested by BLNR in its December 2017 RP holdover approval, and
2) Permanent IIFS compliance solution through structural modifications that ensures both reliable flow release and mauka-to-makai connectivity.

The immediate partial restoration flow has been completed and involved utilizing existing infrastructure to release the IFS volumes back into the stream channel a short distance downstream of the diversion structures. This method was selected because it was the most effective, quickest way to implement the IFS and did not require permits, which would necessitate a significant time delay. These changes were proactively implemented in May of 2018 on the NF and June of 2018 on Waikoko, which was ahead of the BLNR one-year allowance. Additional changes were implemented in January 2019 in compliance with reduced diversion volumes imposed by BLNR in the 2019 revocable permit holdover approval.

A sluice gate is located in the ditch channel approximately 100 feet down-ditch of the North Fork Wailua River Diversion weir. The sluice gate has an invert elevation that is three feet lower than the spillway weir and is the lowest point in the ditch inlet. This gate is used for flushing accumulated sediment out of the ditch inlet and also to dewater the ditch if maintenance

activities need to be done in the dry. The sluice gate's steel leaf was modified with an opening cut at the bottom (Figure 3 below) to release approximately 6 cfs back into the stream channel below the diversion weir. The method is reliable at any streamflow levels, since the opening is at the lowest point and water flows from the sluice gate opening before any flows down-ditch. The released water rejoins the stream channel approximately 100 feet downstream of the spillway.

Figure 3 – IFS release at North Fork Wailua through sluice gate (source: Joule Group, LLC)

Figure 4 – Looking downstream at IIFS release at North Fork Wailua, with stream channel on left, ditch to right and IFS flow release visible in center and bottom left (source: Joule Group, LLC)

A sluice gate is also located in the ditch channel approximately 120 feet down-ditch of the Waikoko Stream Diversion weir. This sluice employs stop logs in lieu of a slide gate and has an invert elevation that is 2.5 feet lower than the spillway weir making it the lowest point in the ditch inlet. The sluice is used for flushing accumulated sediment out of the ditch inlet and also to dewater the ditch if maintenance activities need to be done in the dry. A spacer was inserted below the pani boards (stoplogs) to create a slot at the bottom to release approximately 2 cfs back into the stream channel below the diversion weir. The method is reliable during all streamflows, since the opening is at the lowest point and water flows from the sluice gate opening before any flows down ditch. The released water rejoins the stream channel about 200 feet downstream of the spillway.

Figure 5 – Looking downstream at IIFS release at Waikoko, with stream channel about 100 feet behind the photographer, the ditch to right and IIFS flow release flowing left towards stream (source: Joule Group, LLC)

The permanent solution for IFS compliance involves reconstruction of the existing diversions using a design that retains the IFS requirement in the stream, versus diverting them and returning them.

Compliance and Monitoring

Compliance monitoring of the proposed IFS releases on the North Fork Wailua is being accomplished by CWRM using a gaging station installed in February of 2018 approximately 500 yards downstream of the diversion[2]. This gage features real time telemetry and is identified as the CWRM Kauai 2-191 gage. The period of record is July 25, 2018 until present. The gage is accessible online using the following link:

CWRM Kauai 2-191 NF Wailua blw Blue Hole ID: public PW: public

Figure 6 – CWRM stream gage "Kauai 2-191" downstream of the North Fork Wailua diversion. The staff gage and pipe containing the transducer on the right bank are visible within the highlighted circle.

Compliance monitoring on Waikoko Stream is being accomplished by a new stream gage and data logger installed by CWRM in March of 2019 approximately 100 yards downstream of the Waikoko diversion. Real time telemetry is not set up at this site and records are not yet available from this gage.

Since completion of the immediate partial restoration in March of 2018, KIUC has been taking spot measurements at the CWRM gage locations on both NF Wailua and Waikoko to verify compliance and make any flow adjustments necessary at the sluice gate release points to ensure compliance.

[2] CWRM Staff Submittal – IIFS Recommendation Waikoko and North Fork Wailua Streams 08/21/18 p 21

KIUC has been in compliance with the IIFS releases as verified by the CWRM gage. Figure 7 shows a chart of the entire record from gage Kauai 2-191 since its installation. The data shows flows well in excess of the 6.2 cfs recommendation with many events exceeding 200 cfs. Analysis of the data shows an average flow of 132 cfs for the period of record from 07/25/18 until 06/08/19.

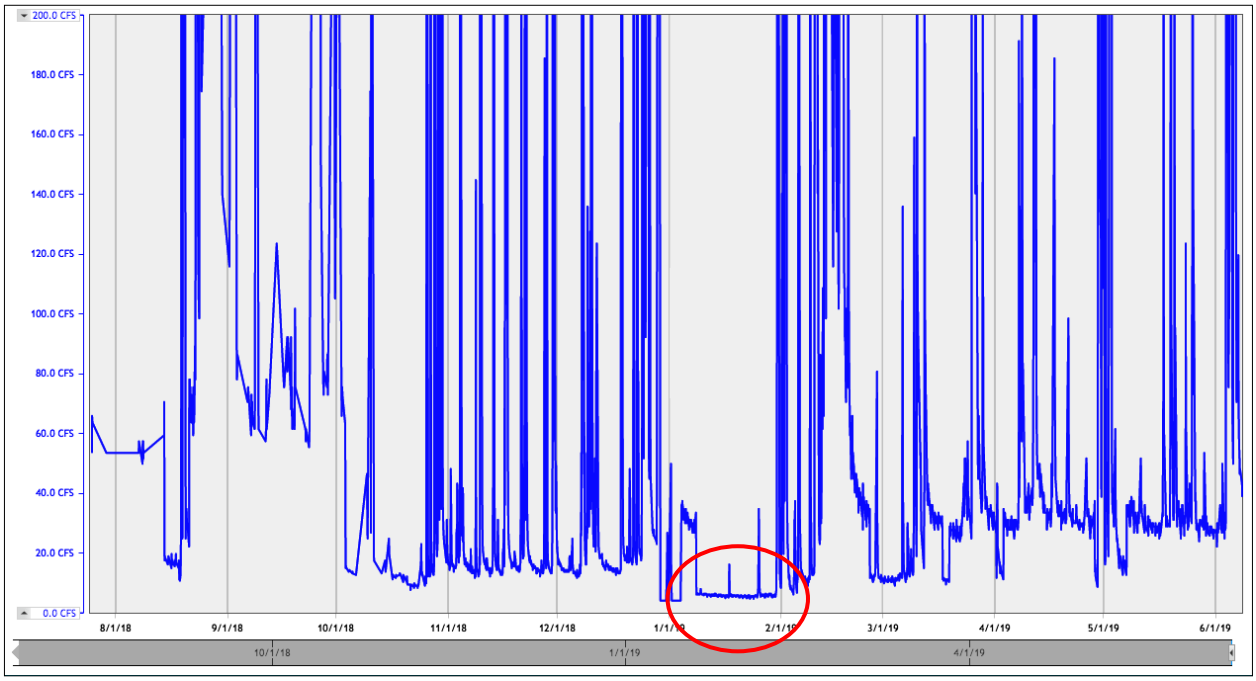

Figure 7 – CWRM stream gage "Kauai 2-191" showing period of record flows with a red highlight on the period of lowest flow when the KIUC IIFS release is keeping the stream wetted

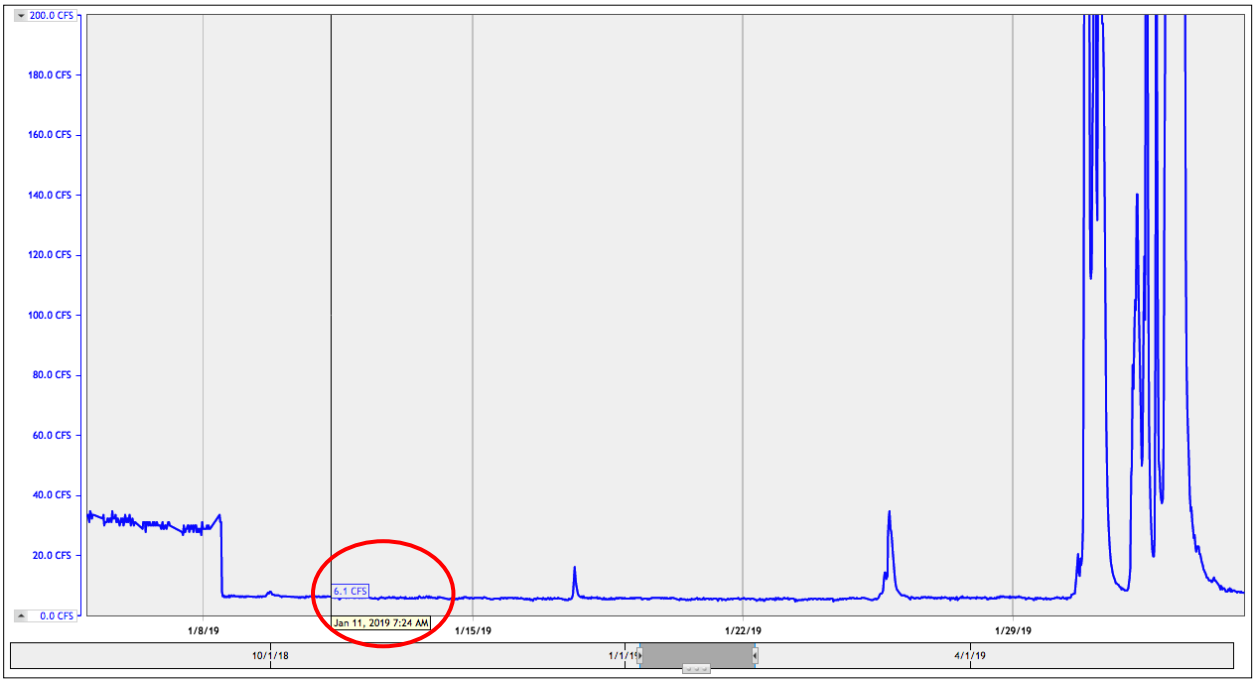

Figure 8 – CWRM stream gage "Kauai 2-191" showing the period of low flow highlighted in Figure 7 above. A random data point callout along the horizontal low-flow charting indicated an instantaneous flow of 6.1 cfs on January 11, 2019.

Hydro Energy Production

As mentioned previously, KIUC's use of the diverted water is hydropower generation. This is accomplished through two legacy hydroelectric plants, arranged in series at the end of the Iliiliula North Wailua Ditch and North Intake Ditch.

Facility Name	Year Built	Capacity	Turbine	Head	Operating Range
Upper Waiahi Hydro	1930	700 kW	1 x Francis	254 ft	7.5 – 26 MGD
Lower Waiahi Hydro	1914	800 kW	1 x Francis	205 ft	14.5 – 43.5 MGD

Table 3 – KIUC Waiahi Hydropower Plants (source: Joule Group LLC)

Francis turbines are well suited for the head (elevational drop) available at the Waiahi sites and generally operate at high efficiencies, which maximize production. However, Francis turbines are limited in the ability to "turn down" or run at fractional outputs. At lower flows, say below 40% of design, the efficiency drops considerably and cavitation will often occur. Typically this is not a problem on irrigation ditches, which were sized intentionally in relation to their water sources to flow reliably at 50 - 100% of their capacity.

The performance curves shown in Figures 9 and 10 were developed using information derived from a combination of testing at Waiahi and manufacturer's data. These curves show the operating characteristics of the hydro generating units. Properly designed and installed, these units are sized to operate efficiently over the expected range of flows available through the

respective ditches. These expected flows were founded on hydrology studies conducted prior to construction and experience with irrigation systems and agricultural needs on Kauai.

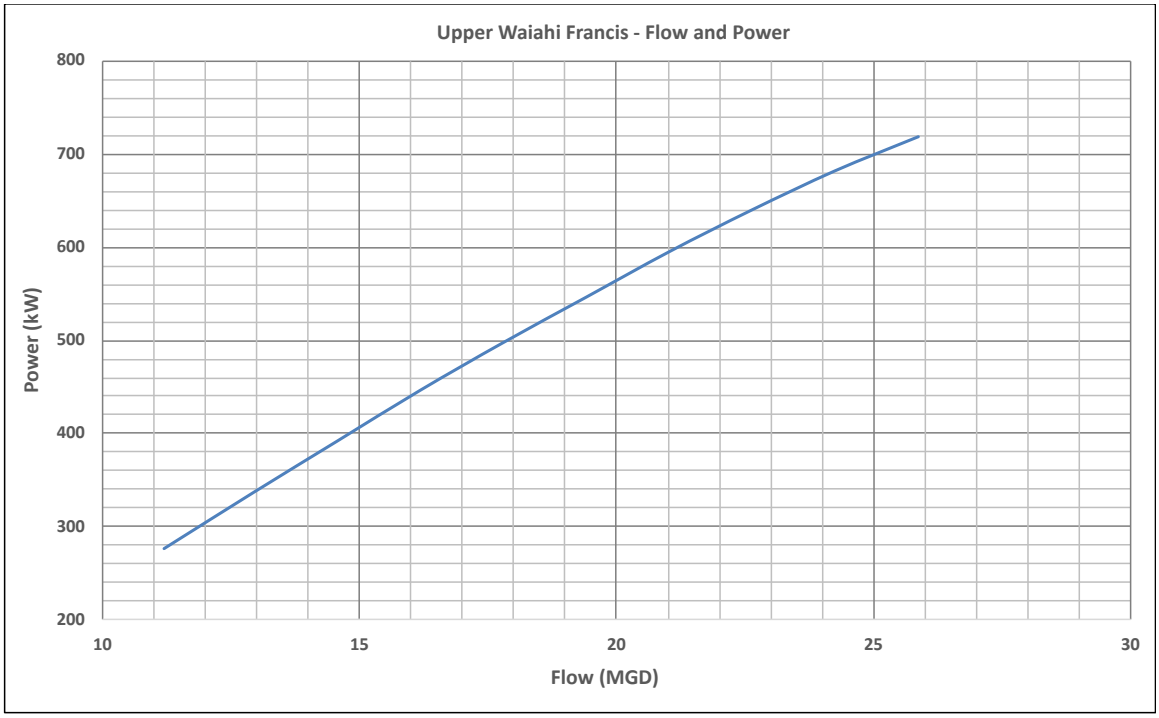

Figure 9 – Upper Waiahi generating unit performance curve (source: Joule Group)

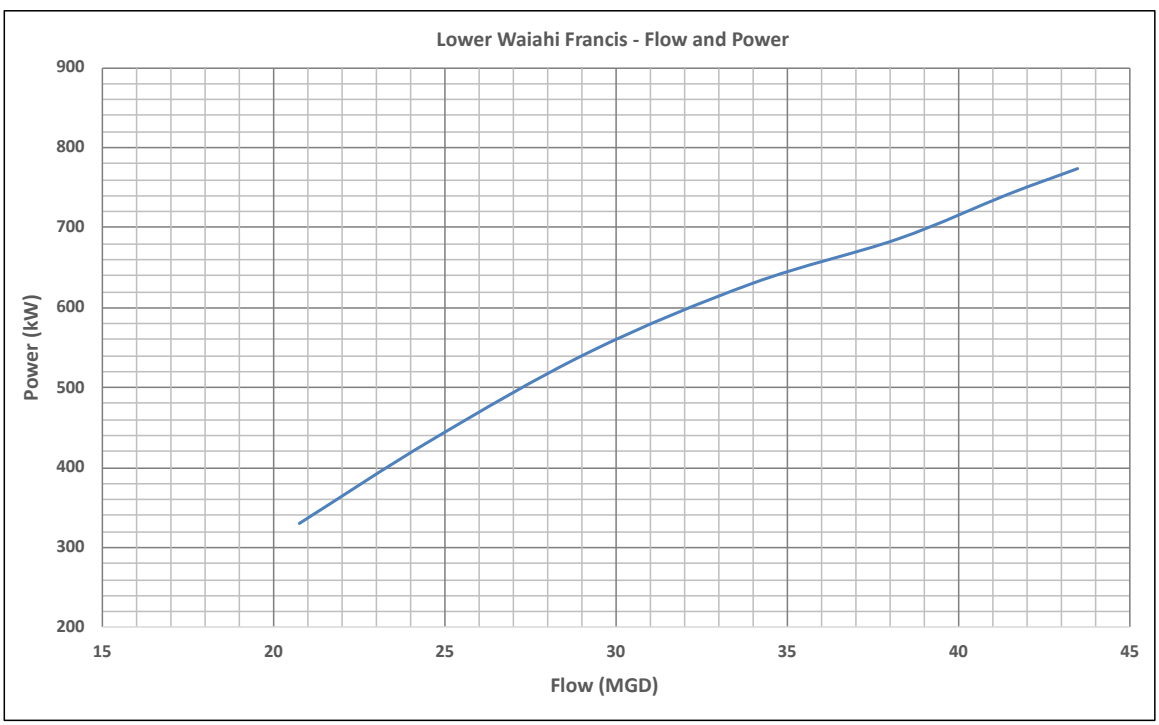

Figure 10 – Lower Waiahi generating unit performance curve (source: Joule Group)

The Upper and Lower Waiahi Hydro facilities are connected to the grid via a single 12.5 kV overhead line from the Lower Hydro to the Kapaia substation. Their combined output is metered and recorded at Kapaia. As shown in Figure 11 and Table 4 below, both of which display a 5 year period of record, the output varies considerably and typically ranges 400,000 to 800,000 kWh per month with an average of 560,450 kWh per month and 6,725,400 kWh annually.

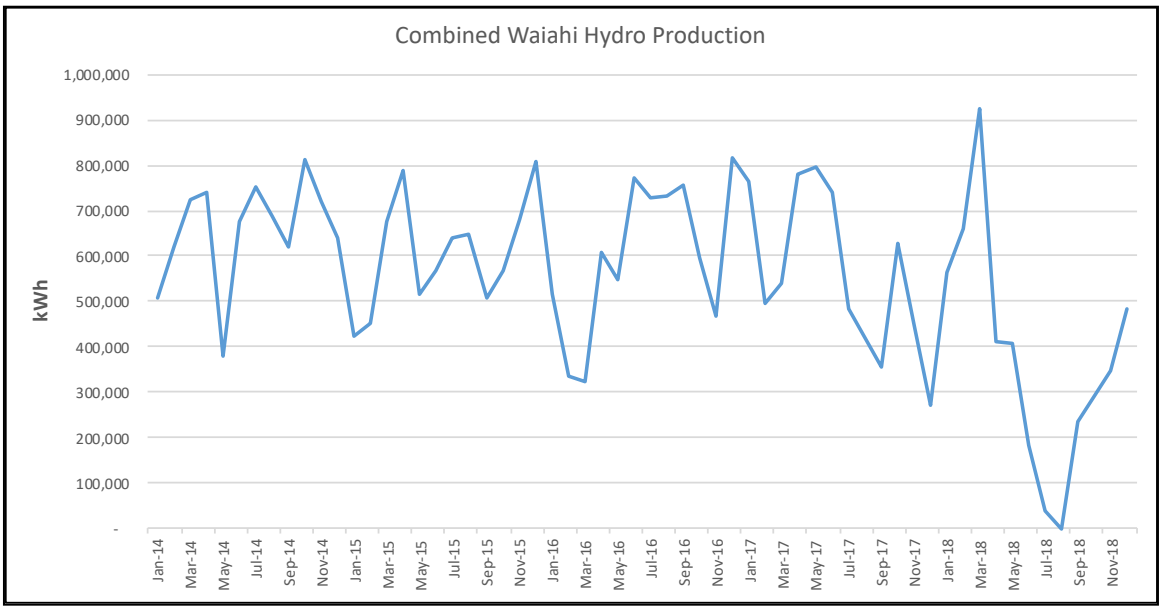

Figure 11 – Combined Waiahi Hydro Production 2014 to 2018 (source: Joule Group)

Facility Name	Period of Record	Minimum Monthly Production	Maximum Monthly Production	Average Monthly Production	Average Annual Production
Combined Waiahi Hydros	01/01/14 to 12/31/18	0 kWh	925,200 kWh	560,450 kWh	6,725,400

Table 4 – KIUC Waiahi Hydropower Combined Monthly Production (source: KIUC)

Separate production meter data for the Upper and Lower Waiahi Hydro's isn't available, except for brief periods where one facility may have been operating and the other facility was off-line. In an effort to address this, the relationship of hydraulic head, efficiency and average operational flow as measured at the tailrace gages was compared with the combined production for the same one year data period as shown in the table below.

Facility Name	Period of Record	Net Head (ft)	Average Operational Flow (cfs)	Relative Production Contribution
Upper Waiahi Hydro	April 2017 to March 2018	250	18.3	40%
Lower Waiahi Hydro	April 2017 to March 2018	200	37.5	60%

Table 5 – Relative Production Contribution (source: Joule Group LLC)

If the Upper Hydro's historic generation is approximately 40% of the combined 6,725,400 kWh historic average, then the Upper Hydro would have produced about 2,690,000 kWh annually and the Lower Hydro would have produced about 4,035,000 kWh annually.

Major rehabilitation work on the Upper Waiahi Hydro was conducted in 2015 with the replacement of the penstock, and in 2016 with the replacement of the turbine and portions of the powerhouse foundation. These improvements were replacements of existing 85 year old equipment with new equipment thereby extending the life of the plant by another 50 – 75 years. The rehabilitation work also resulted in a significant efficiency improvement and an increase in peak capacity from 500 kW to 700 kW. Downtime associated with the rehabilitation construction and ongoing electrical and flowline repairs have offset the increased operational output of Upper Waiahi Hydro in the recent years (2016 to 2019). Additionally, Lower Waiahi has experienced anomalous down-time events due to repairs on the aging penstock, which further eroded 2017 and 2018 production.

As a result of the improvements discussed above, it is forecast that the overall combined average output will increase by approximately 25% from 765 kW average output to a 1,000 kW average annual output (8,760,000 kWh/yr) prior to the impacts associated with reduced diversion flows from the IFS.

Instream Flow Standard Impact to Energy Production

Accurately forecasting the impacts of reduced ditch flow on hydro production is challenging. As was stated above in the *Implications of the IFS and Resultant Water Availability* subsection above, the combined 3.5 MGD (5.4 cfs) and 0.8 MGD (1.3 cfs) IFS volumes can be simplistically subtracted from the 12 month historic average daily flow at Waikoko (USGS 06061200) and provide the result that ditch flows will be reduced by about 28% at the Waikoko gage. To extend this approach, one could simply relate this portion of ditch flow to the total expected volume at the Upper Waiahi Hydro forebay with the addition of the Iliiliula Diversion contribution and determine the reduction to average daily flows that the hydros would have available for generation. Assuming the Iliiliula diversion has an IFS of zero there would be a 23% reduction in flow available to the Upper Waiahi Hydro forebay as expressed in the equation below:

$QW_{AVG} * CR = EQ_{ILI}$ or $13.96 * 0.33 = 4.6$

and

$QW_{AVG} + EQ_{ILI} = HEQ_{HYDRO}$ or $13.96 + 4.6 = 18.56$

and

$HEQ_{HYDRO} – Q_{IIFS} = EFQ_{HYDRO}$ or $18.56 - 4.3 = 14.26$

and

$1 – (EFQ_{HYDRO} / HEQ_{HYDRO}) = EQR_{HYDRO}$ or $1 – (14.26 /18.56) = 23\%$

Where: QW_{AVG} = average historic ditch flow at Waikoko gage = 13.96 MGD
CR = ditch contribution ratio between Iliiliula and NF + Waikoko = 33%
EQ_{ILI} = estimated average daily ditch contribution of Iliiliula diversion = 13.96 * (0.33) = 4.6 MGD
HEQ_{HYDRO} = estimated historic average daily flow at the Upper Hydro forebay
Q_{IIFS} = total of IIFS between NF Wailua and Waikoko = 3.5 +0.8 = 4.3 MGD
EFQ_{HYDRO} = estimated future average daily flow at the Upper Hydro Forebay post IIFS
EQRHYDRO = estimated flow reduction at the Upper

Since the hydro output is a linear function of head, flow and equipment efficiency and both the head and the equipment are unchanged, we can continue this simplistic methodology to reduce generation by a similar amount. As an example, for Upper Waiahi Hydro the power equation at rated flow is:

$(H * Q * E) / 11.8 = kW$ or $(250 \times 38 \times 0.86) / 11.8 = 692$ kW

Where: H = head (the vertical distance from forebay to tailrace) in feet
Q = flow in cfs
E = combined net efficiency of the equipment in percent
kW = output in kilowatts

Assuming the Upper Hydro's generation contribution is 3,504,000 kWh (40% of the forecast 8,760,000 kWh) and if reduced by 23% there would be a loss of 805,920 kWh per year or an adjusted post IIFS generation of 2,698,080 kWh at the Upper Hydro.

A reduced impact is expected at the Lower Waiahi Hydro Plant since its water is a combination of the flows from the Upper Waiahi Hydro tailrace plus diversion amounts from Waiahi Stream and a second Iliiliula diversion, which dilutes the reduction and the impact. While there are multiple ways to estimate the IIFS impact at the Lower Waiahi Hydro, the most straightforward way is to apply the expected average flow reduction at the Upper Waiahi Hydro to the average operational flow measured at the Lower Waiahi Hydro tailrace. This isolates the estimate from the variability in the additional waters diverted from Waiahi or Iliiliula. Using this approach the average operational flow of 25.6 mgd for the period of record minus the 4.3 mgd, that would be left in the streams instead of routed to through the Upper Waiahi Hydro and subsequently picked up by the Lower Waiahi Hydro, results in a post IIFS average operational flow of 21.3 mgd – a reduction of 17%. Since flow is a linear component of the power equation, the reduction in flow translates to the same reduction in output.

The Lower Waiahi Hydro's generation contribution is 5,256,000 kWh (60% of the forecast 8,760,000 kWh) and if reduced by 17% there would be a loss of 893,520 kWh per year or an adjusted post IIFS generation of 4,362,480 kWh at the Lower Waiahi Hydro.

Facility Name	**Pre IIFS Forecast Output (kWh/yr)**	**Post IIFS Forecast Output (kWh/yr)**	**Production Impact (kWh/yr)**	**Production Impact (%)**
Upper Waiahi Hydro	3,504,000	2,698,080	805,920	23%
Lower Waiahi Hydro	5,256,000	4,362,480	893,520	17%
Combined Waiahi Hydros	8,760,000	7,060,560	1,699,440	19.4%

Table 6 – Simplistic IIFS Production Impacts (source: Joule Group LLC)

However, this simplistic analysis is conservative and not fully representational. The method and example above understates the actual impact that can be expected for these reasons:

- Hydrology: Data averaging mutes real time dynamics. The daily and annual averages that the simplistic estimates are based upon are not reflective of actual stream flow patterns. Additionally the IFS reduction to ditch flow is non-linear since the is a fixed value and does not change with variations in stream flow.
- Ditch Capacity: The ditch has a hydraulic capacity limit that reduces actual diversion volumes when the real time stream flow swings to the high side of the daily average.
- Seepage and Losses: Initial inspection and spot measurements along the ditch indicate that ditch losses and seepage are non-linear, i.e. the losses are not a consistent percentage but rather a total volume that is relatively consistent if the ditch is delivering 50% capacity or 100% capacity. Losses are not related to flow velocity but rather appear to be related to basic wetting of the channel. Therefore the relative ditch loss percentage increases with a decrease in average flow.
- Mechanical: The turbine has a non-linear efficiency curve that drops at lower flows as well as an operating range with a low limit. Reduced flows will result in reduced turbine efficiencies and an increased number of days when there is not enough water to operate.
- Cumulative IFS Requirements: Iliiliula and Waiahi Streams contribute a large percentage of the water to the Upper and Lower Waiahi Hydros respectively. The IFS values have not been determined for these diversions and any future IFS requirements at the Iliiliula or Waiahi Diversions will further reduce the average ditch flows and therefore water available for hydro generation. Also, the impacts of the above listed hydrology, ditch dynamic and mechanical factors will be compounded.

Figure 12 below is USGS data that charts two recent months of the East Branch Wailua (USGS 16068000), which is a similar drainage area in the vicinity of the North Fork and Waikoko diversions. There is not a direct relationship or understood linear correlation between the East Branch gage site and the North Fork diversion site. However, the variability is roughly analogous and can be used to illustrate the above listed factors relating to the understatement of

generation impacts if we use daily average flow values and simplistic percentage reductions of flow and energy output.

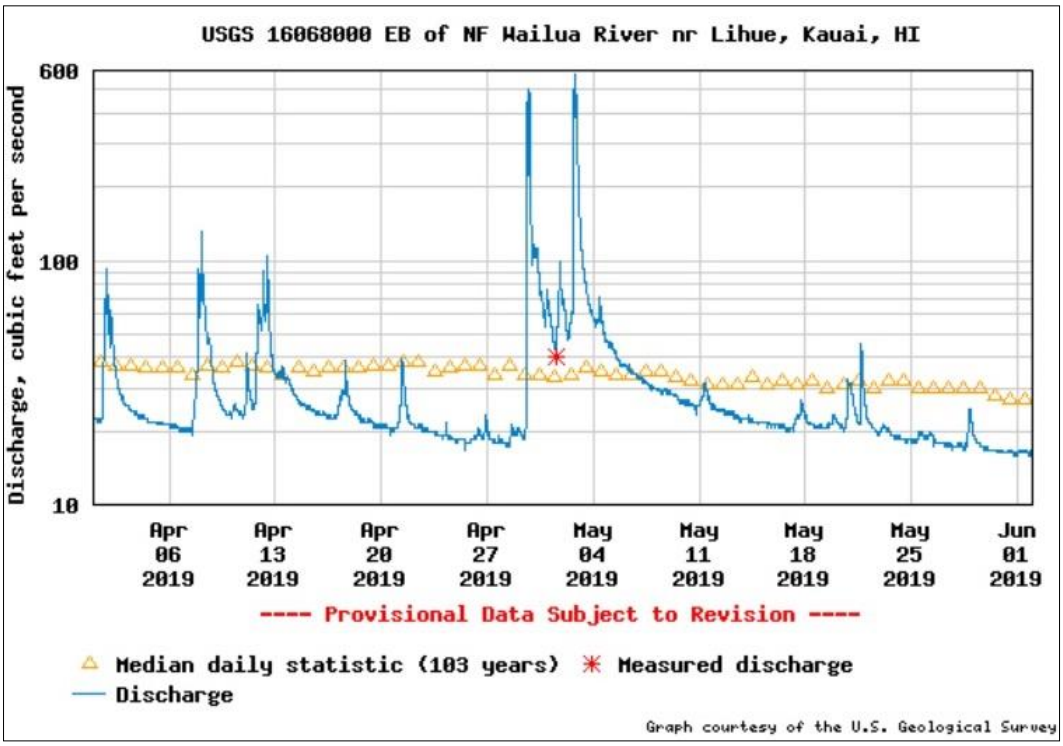

Figure 12 – USGS recorded flow at East Branch Wailua (source: USGS)

This graph illustrates the above real-world separation from the simplistic analysis based on averages over the period of record. The median data plot shows the daily average for each of these calendar days over the period of record, i.e. a statistically "typical" May 18th for instance.

To look more closely at the impacts of real-time variations, a three-day one-hour period with precipitation (April 11 - 12, 2019) from the 60 day chart above was selected. This data is available as a chart and 15 minute sampling records from USGS. The chart is shown in Figure 13 and the data was analyzed to populate Table 5.

USGS Gage ID	USGS Description	Period of Record	Min Flow (cfs)	Max Flow (cfs)	Mean Flow (cfs)
16068000	EB of NF Wailua River Ditch nr Lihue, Kauai, HI	04/11/19 – 04/13/19	24.7	105	42.4

Table 7 – 15 minute Dataset Flow Records - EB NF Wailua River (source: USGS)

On this day the average flow was 23.2 cfs, the minimum was under 20 cfs and the maximum was over 30 cfs. While the range of variability and the overall volume of flow will be different on every day at every location, this example is meant to show the impact of real time flow vs averaged flow on hydro production.

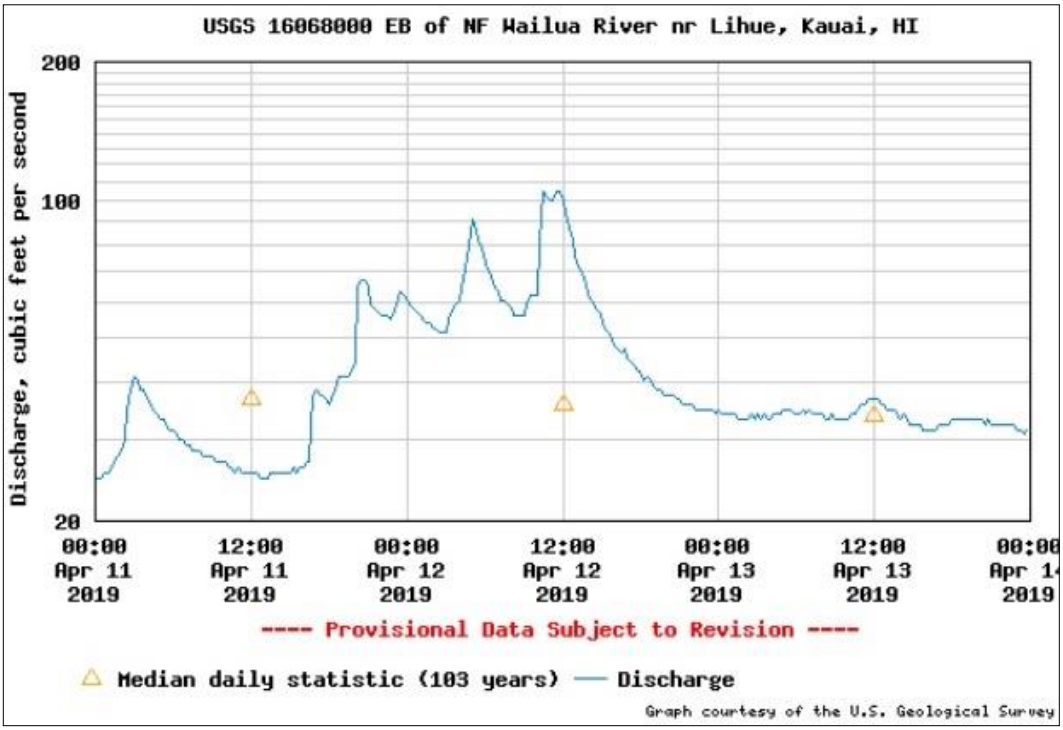

Figure 12 – USGS recorded flow at East Branch Wailua (source: USGS)

To illustrate using this East Branch day with values relationally scaled to what we might see at the North Fork Wailua diversion, we will assume a maximum ditch capacity of 40 cfs (26 mgd), an IFS flow of 5 cfs (3.2 mgd), a total leakage loss of 1.5 cfs (1.0 mgd), and a maximum turbine capacity of 40 cfs(26 mgd). The chart in Figure 13 was created using the USGS data to show these parameters graphically.

If we use the power equation and correct efficiency for the *average flow* of 42.4 cfs (27.4 mgd) on these days we get the following:

H = 250 feet
Q = 42.4 – 5 = 37.4 cfs, which is less than the 40 cfs ditch capacity, so: Q = 37.4 – 1.5 = 35.9 cfs
E = 86.3% (from manufacturer data)(250 * 35.9 * 0.863) / 11.8 = 656 kW x 3 days (72 hrs) = 47,232 kWh for the period.

The next step was to utilize the 15-minute data set and apply the ditch capacity, ditch loss, and associated efficiency to each of those 15 minute flows and calculate the output for each 15 minute block, then total the production for the 3 day period. This is shown in Figure 14. The result of the model showed outputs varying from 290 kW up to 700 kW and a total production of 38,613 kWh for the same period.

This represents an 18.25% reduction in production from the simplistic method using averaging. The calculated reduction is generally representational of what might be expected at the Upper

Waiahi Hydro Plant, however it must be noted that this is a 3 day period with precipitation and more variability and resultant erosion of production than some other periods.

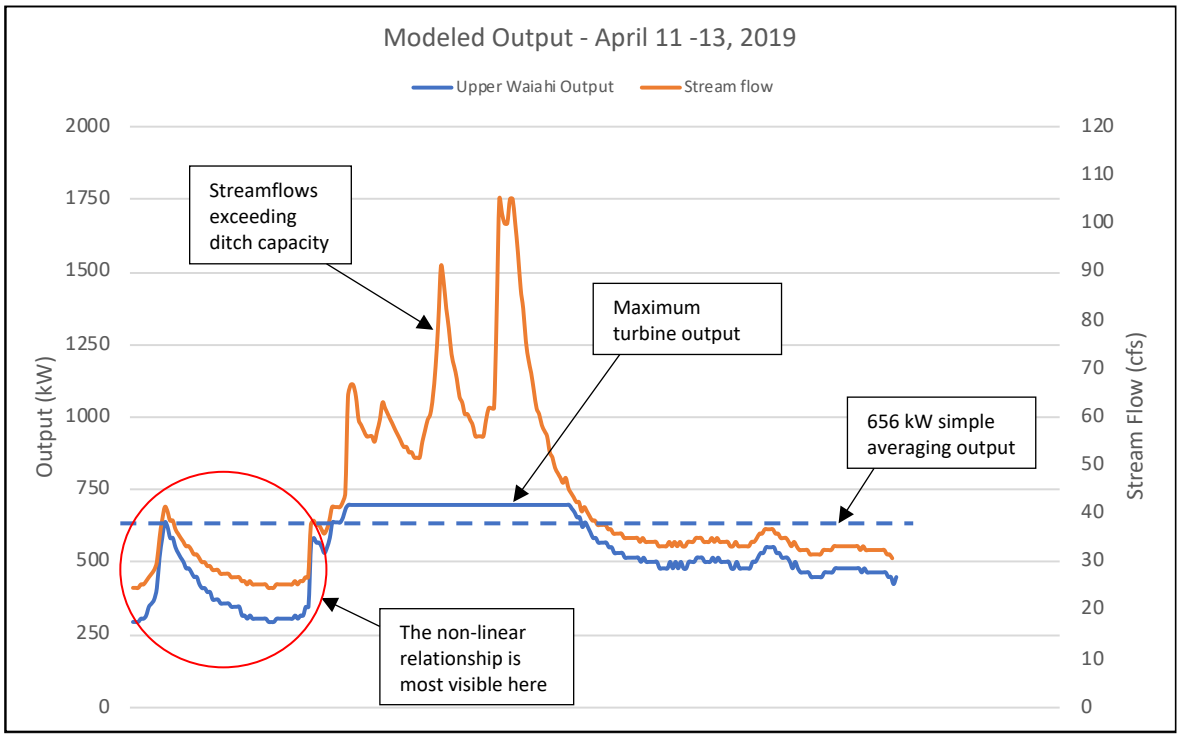

Figure 14 – Modeled Output also showing stream flow and output with simplified methodology (source: Joule Group)

While a 50 kW slice of output is picked up during the rain event, it is capped by ditch and turbine capacity. At the beginning of the plot, where there is a more moderate rain event and the flow is down into the middle of the ditch capacity range, the non-linear effects of the turbine efficiency and ditch loss / flow ratio are seen clearly.

Additionally, while it did not quite happen in this example, the turbine got very close to the bottom of its operating curve for a portion of the period. There will be certain conditions where the ditch flow at the turbine intake will drop below turbine operating limit of 7.5 mgd (11.6 cfs) at the Upper Waiahi Hydro and 14.5 mgd (22.4 cfs) at the Lower Waiahi Hydro and cause the unit to trip off line and the production will drop to zero. In this circumstance the generation would remain at zero until plant operators come from Port Allen to restart the unit the day after the stream flows increase. This circumstance could have a noteworthy impact on production during drier periods and the future implementation of the IFS at Iliiliula and Waiahi Streams will exacerbate this low-operating limit shut down impact significantly.

A cursory analysis of the period of record daily average at USGS 16061200, with the 4.3 mgd (6.7 cfs) combined IFS, a 33% Iliiliula contribution ratio, and a 1.5 cfs seepage loss shows that this low flow turbine operating limit cliff of < 11.6 cfs at Upper Waiahi Hydro would be reached anytime the available ditch flow at Waikoko dropped below 15.3 cfs. This equates to 9% of the

time for the entire period of record using daily average data with *no* IFS requirement at Iliiliula. The actual frequency of this low flow cliff scenario and the ability to stabilize the hydro units at lower than design flows is unknown, but the analysis does demonstrate that the volume level of fixed IFS quantity in relation to the historic variable ditch flow will dramatically increase the frequency of low-flow trip events and the corresponding number of zero generation days.

There is not enough data, nor is there post-IIFS operational experience to accurately forecast the additional impacts of the dynamic factors that will cause the real-time production losses to be greater than the simplistic estimates which use averages and short data sets. However, based on the analysis above, it is clear that the 19.4% noted in the table above is conservative.

Therefore, it is KIUC's opinion that an additional 10 - 15% reduction beyond the simplistically calculated 19.4% IFS related production impact can be expected. This equates to a total impact of 29.5% or a reduction of 2,582,010 kWh to an expected annual generation of 6,177,990 kWh.

Facility Name	**Pre IIFS Forecast Output (kWh/yr)**	**Simplistic Post IIFS Forecast Output (kWh/yr)**	**Real Time & Dynamic IIFS Impacts**	**Forecast Actual Post IIFS Production**	**Expected Production Impact (%)**
Combined Hydros	8,760,000 kWh	7,060,560 kWh	12.5%	**6,177,990 kWh**	**29.5%**

Table 8 – Expected IIFS Production Impact (source: Joule Group LLC)

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APPENDIX C
Terrestrial Flora and Fauna Survey Report

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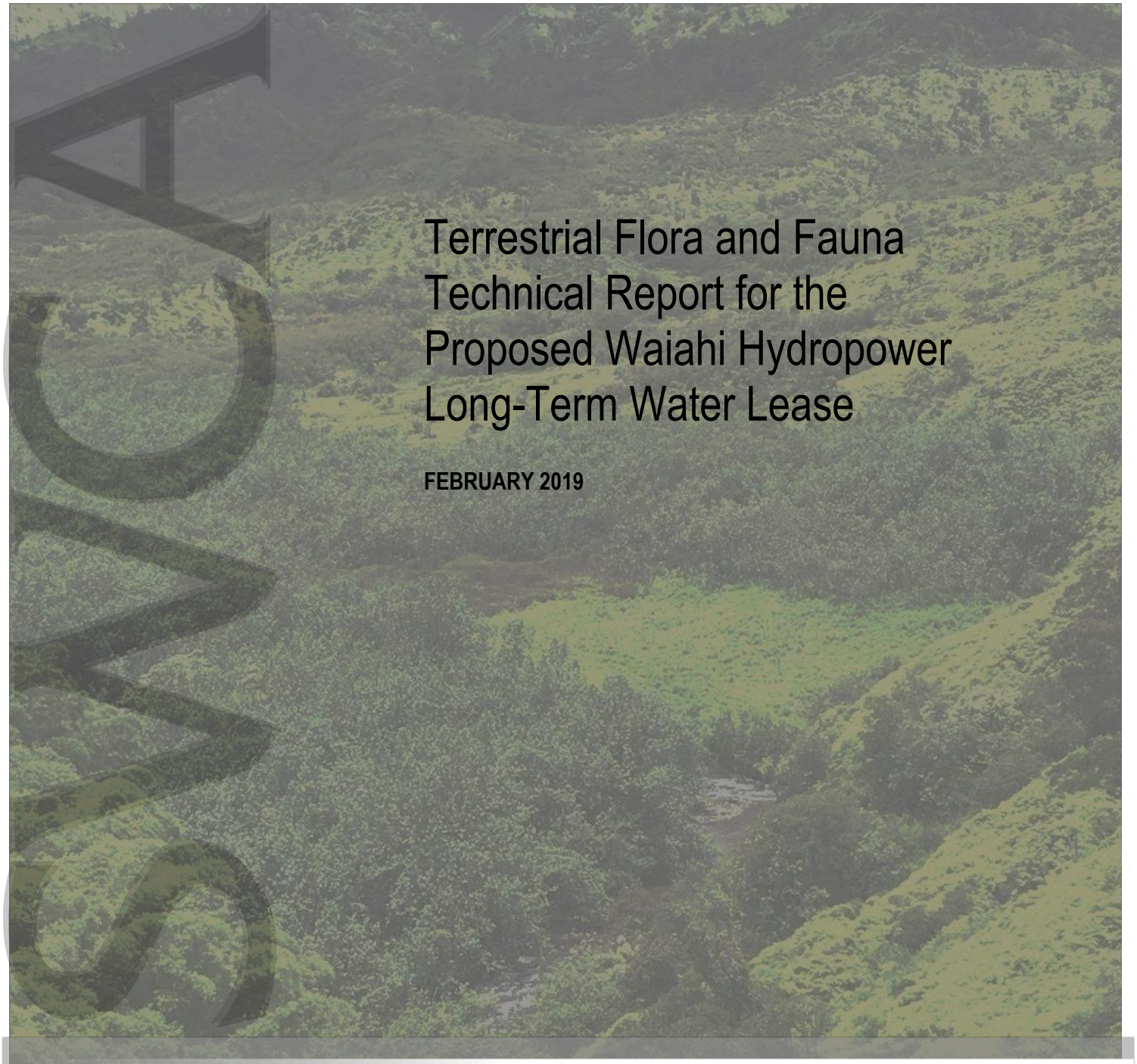

Terrestrial Flora and Fauna Technical Report for the Proposed Waiahi Hydropower Long-Term Water Lease

FEBRUARY 2019

PREPARED FOR

SSFM International

PREPARED BY

SWCA Environmental Consultants

TERRESTRIAL FLORA AND FAUNA TECHNICAL REPORT FOR THE PROPOSED WAIAHI HYDROPOWER LONG-TERM WATER LEASE

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SWCA Project No. 50255.00

February 2019

EXECUTIVE SUMMARY

In support of the Hawai‘i Revised Statutes (HRS) Chapter 343 compliance for the Kaua‘i Island Utility Cooperative (KIUC) Waiahi Hydropower Long-Term Water Lease (project), SWCA Environmental Consultants (SWCA) was contracted by SSFM International (SSFM) to assess terrestrial flora and fauna resources, including the potential for the presence of state or federally listed threatened, endangered, proposed, or candidate species or rare species (hereafter referred to as special-status species).

The flora and fauna surveys were conducted by the SWCA botanist and wildlife biologist from September 19–20, 2018. Ground (automotive and pedestrian) surveys were conducted to determine whether vegetation types and species found during previous surveys and mapping efforts were still present in the survey areas and to record any notable changes. Fauna surveys consisted of both ground and aerial surveys and consisted of visual observations (aided by 10 × 42–millimeter binoculars) and auditory vocalization identifications. All birds, mammals, reptiles, amphibians, fish, and invertebrate species that were seen or heard were noted. Any signs, such as scat or tracks, were also noted. The survey focused on two sites within the Lihue Koloa Forest Reserve from the north fork of the Wailua River (Figure 1). SWCA also surveyed the lower hydropower forebays and maintained areas around the powerhouses on the Waiahi River as part of the long term lease.

Ground flora surveys determined that the Hawai‘i Gap Analysis Program vegetation data layer produced by Gon et al. (2006) was highly representative of the vegetation found in the survey areas. The survey areas comprise primarily alien grassland and alien mixed canopy forest. No special-status plant species were found during ground surveys. However, critical habitat for 18 special-status species is located in the proposed lease area *mauka* (upslope) of the aqueducts, and portions of the aqueducts transect wet cliffs and other suitable habitat for these species.

No threatened or endangered species were found during ground surveys of the survey areas; however, it is possible that these species could or do exist in these areas, particularly on steep cliffs, streamsides, and gulches inaccessible to grazing ungulates.

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Table 4. Birds Observed by SWCA in and near the Survey Areas 8

1 INTRODUCTION

In support of the Hawai‘i Revised Statutes (HRS) Chapter 343 compliance for the Kaua‘i Island Utility Cooperative (KIUC) Waiahi Hydropower Long-Term Water Lease, SWCA Environmental Consultants (SWCA) was contracted through SSFM to assess terrestrial flora and fauna resources, including the potential for the presence of state or federally listed threatened, endangered, proposed, or candidate species or rare species (hereafter referred to as special-status species).The project is located at the North Fork Wailua River and Waikoko Stream (collectively referred to as Blue Hole) (Tax Map Key (4) 3-9-001:001) and north of the Upper Waiahi Powerhouse (Tax Map Key (4) 3-8-001:001). This survey focuses on existing features of the Waiahi Stream hydropower system, referred to as the survey areas (Figure 1). The project area, defined as areas where directed impacts area expected to take place, is smaller than the survey areas. The designated survey areas along the Waiahi stream system consist of diversions, weirs, headgates, and spillways. Each location covered an area no more than 5 square meters. The SWCA survey team observed and recorded terrestrial species up to 20 meters from each designated survey location. The project consists of proposed upgrades to existing facilities and construction of new infrastructure to support hydropower sustainability to provide dependable renewable energy. This report details the field methods, results, impacts analysis, and suggested avoidance and minimization measures for the project. Appendices contain photos, plant list, and agency consultation for threatened and endangered species to support this technical report.

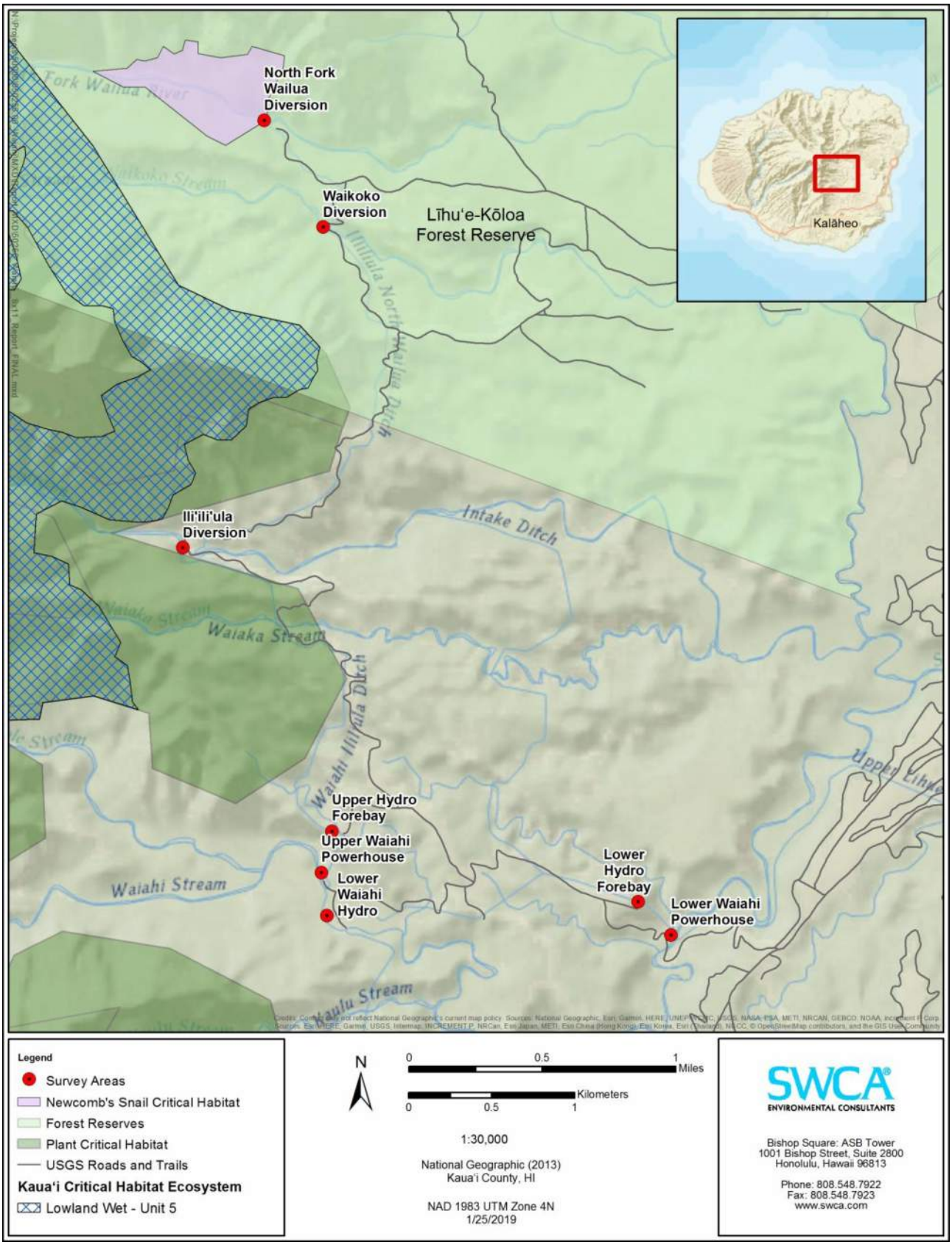

Figure 1. Survey areas along the Waiahi Stream hydropower system.

1.1 Proposed Action

The purpose of the Proposed Action is to obtain a long-term water lease in order to continue to operate the two hydropower systems on Waiahi Stream: the Upper Waiahi Plant and the Lower Waiahi Plant. To continue and improve hydropower with the current system, the Proposed Action will improve the existing diversions at the North Fork Wailua River and Waikoko Streams, which feed into the Waiahi hydropower system. The proposed actions include upgrades and modifications listed in Table 1.

The Proposed Action will ensure the viability and sustainability of renewable energy on the Island of Kaua‘i. The energy generated by hydropower projects reduces imports of oil for conventional diesel electric power generation. The continued operation of KIUC’s Waiahi hydropower plants would assist KIUC in meeting the State of Hawai‘i mandate to achieve 100% renewable energy by 2045.

Table 1. Waiahi Hydropower Proposed Actions

Proposed Actions	Survey Area Section
Improvements on existing diversions and ditch sections	North Fork of the Wailua River located on Lihue Koloa Forest Reserve
Improvements on existing diversions and ditch sections	Iliiliula River Diversion located on the Lihue Koloa Forest Reserve
Long-term water lease, maintain existing Waiahi Hydro infrastructure systems with current management and maintenance actions	Upper and Lower Waiahi Power Plants, Upper and Lower Hydro Forebays

2 REGULATORY ENVIRONMENT

This section describes laws and regulations applicable to terrestrial flora and fauna in the context of the project.

2.1 Endangered Species Act

The federal Endangered Species Act (ESA) of 1973, as amended, is regulated by the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and protects wildlife and plant species that have been listed as threatened or endangered. The purpose of the ESA is to protect and recover imperiled species and their ecosystems. It is administered by the USFWS and NOAA NMFS. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife (USFWS 2018). It is designed to conserve the ecosystem on which species depend. Candidate species, which may be listed in the near future, are not afforded protection under the ESA until they are formally listed as endangered or threatened. Section 9 of the ESA and rules promulgated under Section 4(d) of the ESA prohibit the unauthorized take of any endangered or threatened species of wildlife listed under the ESA. Under the ESA, the term take means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect species listed as endangered or threatened, or to attempt to engage in any such conduct.” As defined in regulations, the term harm means “an act that actually kills or injures wildlife; it may include significant habitat modification or degradation, which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering” (50 Code of Federal Regulations [CFR] 17.3). The rules define harass to mean “an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent, as to

significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

The ESA affords maximum legal protections to species listed as threatened or endangered under the law and also provides authorization for incidental take permits for take that occurs incidental to otherwise legal operations. To comply with federal laws, additional measures must be taken to ensure that take of ESA-listed species does not occur. Any fatality of a listed species should be reported to the USFWS and the Hawai‘i Division of Forestry and Wildlife (DOFAW) as soon as possible, and an incident report should be filed within 24 hours of detection.

2.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, is regulated by the USFWS and prohibits the take of migratory birds. A list of birds protected under MBTA-implementing regulations is published under 50 CFR 10.13. Unless permitted by regulations, under the MBTA, "it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product" (16 United States Code 703–712). The MBTA provides no process for authorizing incidental take of MBTA-protected birds. As a result, birds that are not covered under the ESA that may be adversely affected by the proposed project cannot be covered by take authorizations. Furthermore, a recent memorandum from the Department of the Interior (M-37050, December 22, 2017) concludes that the MBTA does not prohibit the incidental taking of migratory birds. Regardless, incidental take of individual MBTA-protected species is unlikely to adversely affect the species as a whole; however, any take of MBTA-protected species should be documented and reported in a similar manner to any endangered or threatened species of wildlife listed under the ESA.

2.3 Hawai‘i Revised Statutes Chapter 195D

The purpose of Hawai‘i Revised Statutes (HRS) Chapter 195D is "to insure the continued perpetuation of indigenous aquatic life, wildlife, and land plants, and their habitats for human enjoyment, for scientific purposes, and as members of ecosystems." Section 195D-4 states that any endangered or threatened species of fish or wildlife recognized by the ESA shall be so deemed by the state statute. Like the ESA, under DOFAW, the unauthorized take of such endangered or threatened species is prohibited (HRS 195-D-4[e]), but incidental take licenses can be obtained (HRS Section 195D-21). In addition to species protected under the ESA, rules adopted under HRS Section 195D-4 allow for the listing of indigenous species as threatened or endangered due to the following reasons:

- Habitat destruction or alteration (current or predicted)
- Overexploitation
- Disease or predation
- Lack of regulatory mechanisms
- Other factors threatening the species' continued existence

Determinations are made based on any and all available sources of data (scientific, commercial, and other) and consultation with appropriate agencies (federal, state, and county) and interested organizations and parties.

3 LITERATURE REVIEW

SWCA conducted a literature review of published articles, government reports, and scholarly reports in preparation for field surveys. Table 2 lists the reports reviewed and pertinent items gleaned from each report.

Table 2. East Kaua‘i Flora and Fauna Literature Review

Document	Relevance
Final Environmental Assessment Bridge 7E Replacement Project, Kaumuali‘i Highway, Koloa District, Kaua‘i Island, Hawai‘i (State of Hawai‘i, Department of Transportation 2016)	Documents the impact studies of proposed improvements to a bridge on Kaumuali‘i Highway in the Koloa District on the Island of Kaua‘i.
Final Environmental Assessment Adolescent Treatment and Healing Center (Belt Collins Hawaii LLC 2016)	Describes plans to develop an adolescent treatment facility to be located at the intersection of Mā‘alo and ‘Ehiku roads in the Hanamā‘ulu area on the Island of Kaua‘i.
Final Environmental Assessment Finding of No Significant Impact (FONSI) for Kūhiō Highway, Replacement of Hanamā‘ulu (Kapaia) Stream Bridge (State of Hawai‘i, Department of Transportation 2017)	Describes plans to replace the existing Kapaia Bridge in the Līhu‘e District of the Island of Kaua‘i.
Mapping Plant Species Ranges in the Hawaiian Islands: Developing a Methodology and Associated GIS Layers (Price et al. 2007)	Documents the methods used to map the geographic ranges of plant species in upland areas of the Hawaiian Islands using a geographic information system (GIS) and details several practical uses for species range maps.
Draft Environmental Assessment and Anticipated Finding of No Significant Impact (FONSI) for Kapaia Cane Haul Road 18-inch Main (County of Kaua'i Department of Water 2018)	Describes plans to construct an approximately 9,000 foot long, 18-inch diameter water transmission main from `Ehiku Street to Mā`alo Road on the Island of Kaua‘i.
Recovery Plan for the Newcomb’s Snail (USFWS 2006)	Describes habitat and home range of the Newcomb’s snail (*Erinna newcombi*).

4 FIELD METHODS

4.1 Flora

Flora surveys consisted of ground (automotive and pedestrian) surveys of the survey areas. Ground surveys took place from September 19–20, 2018, to determine whether vegetation types and species found during previous surveys and mapping efforts are still present in the area and to record any notable changes. Rocky outcrops, cliffs, gulches, streamsides, and other areas likely to contain native species were closely examined.

Plants recorded during the survey are indicative of the season (rainy versus dry) and the environmental conditions at the time of the survey. Because the survey was conducted during the wet season, a variety of ephemeral herbaceous species were noted. It is likely that additional surveys conducted at a different time of the year would result in minor variations in the species and abundances of plants observed.

An analysis was performed in Esri’s ArcMap to link special-status plants to the Hawai‘i Gap Analysis Program (HIGAP) vegetation classes where they are most likely to occur. This was done by intersecting the USFWS Critical Plant habitat shapefile with the HIGAP raster to calculate which HIGAP vegetation classes were found within each critical habitat polygon.

4.2 Fauna

Fauna surveys consisted of ground (automotive and pedestrian) surveys of the survey areas. Ground surveys were conducted from September 19–20, 2018, and consisted of visual observations (aided by 10 × 42–millimeter binoculars) and auditory vocalization identifications. All birds, mammals, reptiles, amphibians, fish, and invertebrate species that were seen or heard were noted. Any signs, such as scat or tracks, were also noted. Field surveys for the endangered Hawaiian hoary bat, or ‘ope‘ape‘a (*Lasiurus cinereus semotus*), were conducted by noting areas of suitable foraging and roosting habitat as indicators of potential presence; acoustic surveys were not conducted.

5 RESULTS

The following section describes the results of the flora and fauna surveys in the survey areas.

5.1 Flora

5.1.1 *Vegetation Classification*

The HIGAP vegetation data layer, a vegetation mapping project that is part of a nationwide U.S. Department of the Interior program that seeks to classify vegetation types for the purpose of protecting plant and animal species (Gon et al. 2006), was determined to be highly representative of the survey areas. The HIGAP vegetation layer describes only two vegetation cover types in the survey areas: alien grassland and alien forest (see Appendix A). These two vegetation types are described below.

5.1.1.1 ALIEN FOREST

Alien forest made up the majority of the vegetation in the survey areas. The description of this vegetation type in Gon et al. (2006) is as follows: “Mixed, typically dense canopies of alien tree species, often plantation forest plantings, with dominants including, but not limited to: *Eucalyptus*, *Casuarina*, *Falcataria*, *Araucaria*, *Fraxinus*, *Melaleuca*, *Psidium*, and *Grevillea* spp.” Dominant overstory species in this vegetation type in the survey areas varied with location, elevation, and rainfall levels, and included albizia (*Falcataria moluccana*), seen mainly at the Blue Hole Diversion, Waikoko Diversion, Lower Hydro Forebay, and the Lower Waiahi Powerplant; strawberry guava (*Psidium cattleianum*), seen at all sites except the Lower Waiahi Hydro Intake and the Lower Waiahi Power Plant; and the native tree species ‘ōhi‘a (*Metrosideros polymorpha*), seen at all sites except the Lower Hydro Forebay. It was uncommon to see understory species establishing in the dense shade produced by these tree species; however, clidemia (*Clidemia hirta* var. *hirta*), a highly invasive shrub able to establish in deep shade, was seen in the understory of this vegetation type in all sites. Other dominant understory species occasionally seen included prickly Florida blackberry (*Rubus argutus*) and the native fern uluhe (*Dicranopteris linearis*).

5.1.1.2 AILEN GRASSLAND

Nonnative lawn and ruderal grasses such as narrow-leaved carpetgrass (*Axonopus fissifolius*), swollen fingergrass (*Chloris barbata*), Job’s tears (*Coix lachryma-jobi*), barnyard grass (*Echinochloa crusgalli*), basketgrass (*Oplismenus hirtellus*), Guinea grass (*Urochloa maxima*), Hilo grass (*Paspalum conjugatum*), Glenwood grass (*Sacciolepis indica*), and barbas de indio (*Andropogon bicornis*) were found in the project footprint. Mixed in with these grasses at some sites was a variety of cultivated species including

coconut (*Cocos nucifera*), avocado (*Persea americana*), mango (*Mangifera indica*), ti (*Cordyline fruticosa*), banana (*Musa* hybrid), and Turk's cap (*Malvaviscus penduliflorus*) (Appendix A:Figure A-5).

5.1.2 *Special-Status Flora and Critical Habitat*

Special-status flora refers to plant species listed by the USFWS and the State of Hawai‘i under the ESA and/or HRS Chapter 195D as threatened, endangered, or candidate. Table 3 lists the 11 species with designated critical habitat that fall within the survey areas and indicates which vegetation classes (taken from the HIGAP vegetation layer) are found within each critical habitat unit. See Figure A-4 in Appendix A for the locations of the critical habitat units. DOFAW has identified an additional 22 federally listed endangered, threatened, or otherwise rare plant species that may occur near the vicinity of the survey areas: *Adenophorus periens*, *Anoectochilus sandvicensis*, *Cyanea dolichopoda*, *Cyanea recta*, *Cyrtandra heinrichii*, *Cyrtandra kamoolaensis*, *Cyrtandra kealiae* subsp. *kealiae*, *Cyrtandra oenobarba*, *Dubautia plantaginea* subsp. *magnifolia*, *Euphorbia remyi* var. *kauaiensis*, *Euphorbia remyi* var. *remyi*, *Eurya sandwicensis*, Hib*iscus kokio* subsp. *kokio*, *Isodendrion longifolium*, *Lysimachia iniki*, *Lysimachia pendens*, *Melicope paniculata*, *Microsorum spectrum* var. *pentadactylum*, *Platydesma rostrate*, *Polyscias flynnii*, *Pritchardia flynnii*, and *Pritchardia hardyi* (see Appendix B). No threatened or endangered species were found during ground surveys of the survey areas; however, it is possible that these species could or do exist in these areas, particularly on steep cliffs, streamsides, and gulches inaccessible to grazing ungulates.

Table 3. Endangered or Threatened Plant Species with Critical Habitat within the Survey Areas

HIGAP Vegetation Classes Found in Critical Habitat Unit	Species found in Critical Habitat Unit (Scientific Name)
Lowland Wet - Unit 5	
Native wet cliff vegetation Native wet forest and shrubland Open ‘ōhi‘a forest Alien shrubland Alien forest	*Cyanea asarifolia* *Cyanea remyi* *Cyrtandra limahuliensis* *Dubautia pauciflorula* *Hesperomannia lydgatei* *Labordia lydgatei* *Labordia tinifolia* var. *wahiawaensis* *Lysimachia filifolia* *Phlegmariurus nutans* *Plantago princeps* var. *longibracteata* *Pteralyxia kauaiensis*
Wet Cliff - Unit 2	
Bog vegetation Native wet cliff vegetation Native wet forest and shrubland Open ‘ōhi‘a forest Alien forest	*Cyanea asarifolia* *Cyrtandra limahuliensis* *Labordia lydgatei* *Lysimachia filifolia* *Phlegmariurus nutans* *Plantago princeps* var. *longibracteata* *Pteralyxia kauaiensis*

5.2 Fauna

The fauna observed in the survey areas includes species that are indigenous, migratory, and non- native introductions. The species observed during the survey are expected to occur at all the survey sites throughout the survey area. The indigenous and migratory species often require specific niche habitats and are frequently locally abundant where they occur. The nonnative introduced species tend to be more generalist and often occupy a broad range of habitats.

5.2.1 *Avifauna*

The birds observed in the survey areas are species commonly found near waterways, grassland, and forest areas 550 feet (168 meters) to 1,150 feet (351 meters) above sea level on the Island of Kaua‘i. In all, 14 bird species were documented, five of which are protected by the MBTA (Table 4). Of these, one is an indigenous waterbird, one is an indigenous seabird, one is a migratory shorebird, and 11 are nonnative introductions.

Table 4. Birds Observed by SWCA in and near the Survey Areas

Common Name	Scientific Name	Status*	MBTA
Black-crowned night heron	*Nycticorax*	I	X
Brazilian cardinal	*Paroaria coronata*	NN	–
Cattle egret	*Bubulcus ibis*	NN	X
Chestnut munia	*Lonchura atricapilla*	NN	–
Common myna	*Acridotheres tristis*	NN	–
Feral chicken	*Gallus domesticus*	NN	–
House finch	*Haemorhous mexicanus*	NN	X
Japanese white-eye	*Zosterops japonicus*	NN	–
Melodious laughingthrush	*Garrulax canorus*	NN	–
Nutmeg mannikin	*Lonchura punctulata*	NN	–
Pacific golden-plover	*Pluvialis fulva*	M	X
Rose-ringed parakeet	*Psittacula krameri*	NN	–
White-tailed tropicbird	*Phaethon lepturus*	I	X
White-rumped shama	*Copsychus malabaricus*	NN	–
	Total species	**14**	**5**

* Status: I = indigenous, NN = nonnative permanent resident, M = migrant

5.2.2 *Mammals*

Mammals detected during the surveys include feral pig (*Sus scrofa*) and feral cat (*Felis catus*). No other mammals were observed during the ground surveys, although rat (*Rattus* spp.), and mouse (*Mus musculus*) could be expected to occur.

The potential for the presence of Hawaiian hoary bat was assessed based on the presence of suitable habitat and vegetation types; no acoustic survey was conducted. Hawaiian hoary bats forage and roost in pastures, croplands, orchards, forests, and developed lands such as golf courses, urban areas, and suburban yards. Hawaiian hoary bats are solitary and roost in exotic and native woody vegetation. They could forage and roost in the grassland and forest habitat types throughout the survey areas. The birthing and pup-rearing season typically occurs between June 1 and September 15. It is common for adult females to leave flightless young unattended in “nursery” trees and shrubs while foraging.

5.2.3 *Terrestrial Reptiles and Amphibians*

No terrestrial reptiles or amphibians are native to Hawai‘i. The metallic skink (*Lampropholis delicata*), and American bullfrog (*Rana catesbeiana*) were the only species detected during the ground surveys.

5.2.4 *Insects and other Invertebrates*

Nine invertebrates were observed during the surveys, consisting of the house fly (*Musca domestica*), honey bee (*Apis* sp.), potter wasp (*Nesodynerus* sp.), unknown endemic damselfly (*Megalagrion* spp.), green darner (*Anax junius*), black witch moth (*Ascalapha odorata*), cabbage white (*Pieris rapae*), aedes mosquito (*Aedes* sp.), and rosy wolfsnail (*Euglandina rosea*). All these invertebrates are common on the Island of Kaua‘i.

5.2.5 *Special-Status Fauna*

Special-status fauna refers to wildlife species listed by the USFWS and the State of Hawai‘i as threatened, endangered, or candidate. The USFWS and the State of Hawai‘i list eight endangered species that may occur in the survey areas (Appendix C). These species are Hawaiian moorhen (*Gallinula galeata sandvicensis*), and Hawaiian duck (*Anas wyvilliana*) (collectively referred to as Hawaiian waterbirds); Hawaiian goose (*Branta sandvicensis*); Hawaiian petrel (*Pterodroma sandwichensis*), band-rumped storm-petrel (*Oceanodroma castro*), and Newell’s shearwater (*Puffinus auricularis newelli*) (collectively referred to as Hawaiian seabirds); Hawaiian hoary bat; and Newcomb’s snail (*Erinna newcombi*). No special-status species were observed during the survey, although suitable habitat does occur. These species are discussed in detail below.

5.2.5.1 HAWAIIAN WATERBIRDS

The Hawaiian moorhen, and Hawaiian duck constitute the Hawaiian waterbird group. Because these species share similar habitat needs and biological characteristics, they can be discussed as a single group. Hawaiian waterbirds are most likely to be found in areas associated with wetlands and waterways. These waterbirds are found in a variety of wetland habitats such as freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) lo‘i or patches, irrigation ditches, sewage treatment ponds, and in the case of the Hawaiian duck, montane streams and marshlands (USFWS 2011). Hawaiian waterbirds are known to feed on aquatic and terrestrial grasses (*Poaceae*), aquatic vegetation, seeds and vegetative material of various aquatic plants; and snails, beetles (*Coleoptera*), true bugs (*Hemiptera*), ants and wasps (*Hymenoptera*), true flies (*Diptera*), spiders (*Araneida*), crustaceans (*Crustacea*), dragonflies and damselflies (*Odonata*), leeches, and various other aquatic invertebrates (Bannor and Kiviat 2002; Engilis et al. 2002). Hawaiian waterbirds could forage in the alien grassland vegetation type, wetlands, and waterways in the survey areas. There are no records of Hawaiian waterbird nesting in the survey areas (Appendix C).

5.2.5.2 HAWAIIAN GOOSE

Hawaiian geese are adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian Islands, with negligible dependence on freshwater habitat. The Hawaiian goose uses various habitat types ranging from beach strand, shrubland, and grassland to lava rock (Banko 1988; Banko et al. 1999). Hydroseeding can attract Hawaiian geese to feed. Potential effects to the Hawaiian goose include vehicle strikes, injury from equipment, displacement from foraging and nesting areas, nest disturbance, and brood fragmentation. The majority of documented food items include leaves and seeds of grasses and sedges, leaves and flowers of various fruits of several species of shrubs (USFWS 2004). Suitable forage habitat is located in the alien grassland vegetation type. The Hawaiian goose is known to nest under ōhi‘a and ‘ama‘u (*Sadleria cyatheoides*) and could nest under these species in the alien forest vegetation type (USFWS 2004).

5.2.5.3 HAWAIIAN SEABIRDS

The Hawaiian petrel, band-rumped storm petrel, and threatened Newell's shearwater constitute the seabirds group. Because these species share similar habitat needs and biological characteristics, they can be discussed as a single group. Hawaiian seabirds are not known to nest in the survey areas, however they may traverse over the survey areas while traveling between their upland nest colonies and the ocean (Appendix C).

5.2.5.4 HAWAIIAN HOARY BAT

Hawaiian hoary bat occurs on the Island of Kaua‘i in native, nonnative, agricultural, and developed landscapes (U.S. Department of Agriculture [USDA] 2009; USFWS 1998). Hawaiian hoary bats forage in open, wooded, and linear habitats with a wide range of vegetation types. These animals are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands up to 300 feet (100 m) offshore (USDA 2009). Hawaiian hoary bats typically roost in trees greater than 16 feet (5 m) with dense canopy foliage or in the subcanopy when the canopy is sparse and there is open access for launching into flight (Gorresen et al. 2013; USDA 2009).

The potential for the presence of Hawaiian hoary bat was assessed based on the presence of suitable habitat. The Hawaiian hoary bat has been documented roosting in ‘ōhi‘a, albizia (Falcataria moluccana), ironwood (*Casuarina equisetifolia*), eucalyptus (*Eucalyptus* spp.), avocado (*Persea Americana*), and mango (*Mangifera indica*) and could roost in trees similar in structure. In addition, the Hawaiian hoary bat could forage over the alien forest and alien grassland habitat types throughout the survey areas.

5.2.5.5 NEWCOMB'S SNAIL

The North Fork Wailua Diversion project area boarders designated critical habitat for the Newcomb's snail. The Newcomb's snail is restricted to cool, clean, moderate-to fast-flowing freshwater streams on the Island of Kaua‘i between 643 and 1,299 feet (196 to 396 m) (USFWS 2006). The specific habitat requirements of Newcomb's snail include fast-flowing perennial streams with stable springs, rock seeps, and vertical-to-overhanging waterfalls. Most of the snail populations are found at an elevation of about 1,000 feet (Appendix C). This snail is limited to 10 small stream and spring sites within six watersheds in the mountainous interior of the Island of Kaua‘i (USFWS 2006). Surveys of many of the large, perennial streams of Kaua'i indicate that Newcomb's snail is rarely found in main stream channels. Suitable habitat is generally associated with small, spring-fed tributaries and seeps, and, less commonly waterfalls located in the main channel of smaller streams (Appendix C). The Newcomb's snail is believed to feed on algae and vegetation growing on submerged rocks. Threats to the Newcomb's snail include reduced stream flow from drought, water diversion projects, or other natural and human causes; predation by introduced snails, flies, and aquatic species; and small population dynamics (Appendix C).

One sighting of Newcomb's snail occurred at an unspecified site upstream of the North Fork Wailua Diversion site in 1995 (Appendix D). Additional surveys of the area have failed to detect the presence of Newcomb's snail in the area. The USFWS surveyed 1,640 feet (500 m) upstream and 1,640 feet (500 m) downstream of the North Fork Wailua Diversion in March 2018. No snails were observed (Appendix D). It is likely that the Newcomb's snail critical habitat that borders the North Fork Wailua Diversion site is unoccupied and that work in the area is extremely unlikely to affect Newcomb's snail critical habitat (Gordon Smith personal comment).

6 AVOIDANCE AND MINIMIZATION MEASURES

6.1 Flora

Although no plant species listed or proposed for listing as threatened or endangered under the ESA, or candidates for possible future listing as threatened or endangered under the ESA, were found during ground surveys of the survey areas, some project footprints are located in close proximity to critical habitat designated for these species. For this reason, a botanical monitor should be on-site during any maintenance activities near the critical habitat units. The botanical monitor should possess the following qualifications:

- Familiarity with the plants of the area, including special-status species
- Familiarity with natural communities of the area, including special-status natural communities
- Experience conducting floristic field surveys
- Experience with analyzing impacts of development on native plant species and natural communities

To avoid the unintentional introduction or transport of new invasive plant species into more pristine portions of the survey areas during maintenance activities, all equipment and vehicles arriving from outside all portions of the survey areas located near designated critical habitat should be washed and inspected prior to any maintenance or construction activities. In addition, construction materials arriving from outside the Island of Kaua‘i should be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful nonnative species (plants, amphibians, reptiles, and insects). When possible, any raw materials used in maintenance and construction activities should be purchased from a local supplier on the Island of Kaua‘i to avoid introducing nonnative species not present on the island. Inspection and cleaning should be conducted at a designated location.

The inspector must be a qualified botanist/entomologist able to identify invasive species that are of concern relevant to the point of origin of the equipment, vehicle, or material. Invasive species that should be checked for during inspections can be found at the following online locations:

- U.S. Department of Agriculture, Hawai‘i State-listed Noxious Weeds: http://plants.usda.gov/java/noxious?rptType=State&statefips=15
- Kaua‘i Invasive Species Committee Target Pests: http://www.kauaiisc.org/kiscpests/

6.2 Fauna

Regular on-site staff should be trained to identify special-status species with the potential to occur on-site and should know the appropriate measures to be taken if they are present. A post–construction report should be submitted to the DOFAW Kaua‘i office within 30 days of the completion of the project. The report should include all wildlife surveys, observations, and monitoring reports; wildlife incidents; and the date, time and location of the incident. The report should also include photos of the site before, during, and after the construction project is completed (Appendix C). All sick, injured, or dead species-status wildlife should be reported to DOFAW Kaua‘i office. To minimize potential impacts to fauna, the following measures should be followed:

- Hawaiian waterbirds and Hawaiian Goose
    - A qualified biological monitor should conduct special-status waterbird nest surveys where suitable habitat occurs near the survey areas 2 weeks prior to project construction.

Surveys should be repeated within 3 days of project initiation and after any subsequent delay of work of three or more days.

  - If an active nest is discovered in the survey areas, the project will be delayed until the chicks or ducklings have fledged the area.
  - A 100-foot (30-m) buffer around all active nests and/or broods should be created and maintained until the chicks/ducklings have fledged. Activities that could alter behavior and/or alter habitat should be avoided.

- Hawaiian seabirds
  - Construction activity should be restricted to daylight hours as much as practicable during the seabird peak fallout period (September 15 to December 15) to avoid the use of nighttime lighting that could attract seabirds.
  - All outdoor lights should be shielded to prevent upward radiation. This has been shown to reduce the potential for seabird attraction. A selection of acceptable, seabird-friendly lights can be found online at the State of Hawai‘i DLNR website: http://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.
  - Outside lights not needed for security and safety should be turned off from dusk through dawn during the fledgling fallout period (September 15 to December 15).

- Hawaiian hoary bat
  - If felling of standing trees occurs during the bat breeding season, direct impacts could occur to juvenile bats that are too small to fly but too large to be carried by a parent. To minimize this impact, no trees taller than 15 feet (4.6 m) should be trimmed or removed between June 1 and September 15.
  - The use of barbless top-strand wire is recommended for all fence construction to avoid entanglement of Hawaiian hoary bat.

- Newcomb’s snail
  - The best management practices for work in aquatic environments found in Appendix C should be incorporated into the project design to minimize the degradation of water quality and impacts to fish and wildlife resources.
  - The USFWS should be consulted before any work is performed in close proximity to or within streams and water bodies.
  - Required permits need to be acquired and accurate surveys need to be conducted before any work is performed in close proximity to or within streams and water bodies.

- Migratory Bird Treaty Act species
  - If a downed tree must be removed from a road, trail, or other passageway, it will be inspected for the presence of active bird nests, specifically the nest of an MBTA-protected species that may have been present prior to the tree falling. If an active nest is found, it should be protected in place until the chicks fledge.

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APPENDIX A

Photographs of Survey Areas

Figure A-1. View of the Blue Hole Diversion. The predominant vegetation type in this site was alien forest, which in this area consisted of an overstory of nonnative tree species including albizia (*Falcataria moluccana*), strawberry guava (*Psidium cattleianum*), and common guava (*Psidium guajava*), in addition to the native tree species ‘ōhi‘a (*Metrosideros polymorpha*). The nonnative species hau (*Hibiscus tiliaceus*) and *Melastoma septemnervium* were seen dominating the midstory. Clidemia (*Clidemia hirta* var. *hirta*), *Rubus argutus*, glenwood grass (*Sacciolepis indica*), basket grass (*Oplismenus hirtellus*) and the native fern uluhe (*Dicranopteris linearis*) dominated the understory in this diversion.

Figure A-2. View of the Waikoko Diversion. The only vegetation type in this site is alien forest, but the native species ‘ōhi‘a can be seen in localized areas, interspersing with a canopy of albizia. As in the Blue Hole Diversion, the invasive species *Melastoma septemnervium* dominates the midstory in this site, and a variety of ruderal herbaceous species can be found in the understory.

Figure A-3. View of the Ili‘ili‘ula Diversion taken during pedestrian surveys. Vegetation types in this area include alien forest, open ‘ōhi‘a forest, and alien grassland. Shown here is an ‘ōhi‘a forest with kukui (*Aleurites moluccana*), common guava, and mountain apple (*Syzygium malaccense*) interspersed throughout. Clidemia, umbrella sedge (*Cyperus involucratus*), barnyard grass (*Echinochloa crusgalli*), and *Richardia scabra* dominate in the open areas.

Figure A-4. View of the Upper Hydro Forebay. Flora in the project footprint consisted almost entirely of the alien grassland vegetation type, which is dominated by nonnative grasses and sedges such as narrow-leaved carpetgrass (*Axonopus fissifolius*), *Fimbristylis dichotoma,* barnyard grass, and the highly invasive barbas de indio (*Andropogon bicornis*). These grasses are promoted by mowing, spraying herbicide, bulldozing, and other maintenance activities evident in the area. Care should be taken to ensure that these activities do not spread these invasive grasses to the nearby native-dominated open ‘ōhi‘a forest.

Figure A-5. View of the Lower Waiahi Hydro Intake. Alien grassland and alien forest vegetation types can be found in this area. The footprint is dominated by ruderal species such as artillery plant (*Pilea microphylla*), barnyard grass, nut grass (*Cyperus rotundus*), and narrow-leaved carpetgrass punctuated by ornamental species such as coconut (*Cocos nucifera*) and avocado (*Persea americana*).

Figure A-6. View of the vegetation found near the Upper Hydro Powerhouse. Like nearby sites, the vegetation in this area consisted of alien grassland and alien forest, interspersed with cultivated plants such as mango (*Mangifera indica*), ti (*Cordyline fruticosa*), avocado, banana (Musa sp.), and Turk's cap (*Malvaviscus penduliflorus*).

Figure A-7. View of the Lower Hydro Forebay. The alien grassland and alien forest vegetation types predominate in this area. Prominent species in the alien grassland vegetation include Hilo grass (*Paspalum conjugatum*), nut grass, barbas de indio, dallis grass (*Paspalum dilatatum*), barnyard grass, and various herbaceous ruderal species. Species dominating the alien forest vegetation type in this area are found on the margins and include albizia, strawberry guava, and satinleaf (*Chrysophyllum oliviforme*).

Figure A-8. View of the vegetation around the Lower Waiahi Power Plant. Trees in this area are found along the margins and interspersed in the lawn. Tree species include loquat (*Eriobotrya japonica*), satinleaf, coconut, apple (*Malus* sp.), and peach (*Prunus persica*). Narrow-leaved carpetgrass, clidemia, artillery plant, and nut grass dominate the lawn and the alien forest understory.

APPENDIX B

Master Plant List

Table B-1. Master Plant List

Superfamily	Family	Scientific Name and Authorship	Status	Common Name	Blue Hole Diversion	Waikoko Diversion	Ili‘ili‘ula Diversion	Upper Hydro Forebay	Lower Waiahi Hydro Intake	Upper Hydro Powerhouse	Lower Hydro Forebay	Lower Waiahi Power Plant
Dicot	Anacardiaceae	*Mangifera indica* L.	X	mango	x					x	x	
Dicot	Apiaceae	*Centella asiatica* (L.) Urb.	X	Asiatic pennywort	x		x				x	
Dicot	Asteraceae	*Ageratina riparia* (Regel) R.M.King & H.Rob.	X	Hāmākua pāmakani, spreading mist flower			x		x			
Dicot	Asteraceae	*Ageratum conyzoides* L.	X	maile hohono	x	x	x	x	x	x	x	
Dicot	Asteraceae	*Conyza bonariensis* (L.) Cronquist	X	hairy horseweed	x					x		
Dicot	Asteraceae	*Elephantopus mollis* Kunth	X	elephant's-foot	x	x		x	x		x	x
Dicot	Asteraceae	*Erechtites hieracifolia* (L.) Raf. ex DC.	X	fireweed	x	x	x					
Dicot	Asteraceae	*Hypochoeris radicata* L.	X	hairy cat's-ear, gosmore	x	x					x	
Dicot	Asteraceae	*Pluchea indica* (L.) Less.	X	Indian fleabane, marsh fleabane				x	x			
Dicot	Asteraceae	*Sonchus oleraceus* L.	X	sow thistle, pualele					x			
Dicot	Asteraceae	*Sphagneticola trilobata* (L.) Pruski	X	wedelia			x	x	x		x	
Dicot	Begoniaceae	*Begonia hirtella* Link	X		x	x			x			
Dicot	Bignoniaceae	*Spathodea campanulata* P.Beauv.	X	African tulip tree, fountain tree						x		
Dicot	Brassicaceae	*Nasturtium officinale* R.Br.	X	watercress			x					
Dicot	Buddlejaceae	*Buddleja asiatica* Lour.	X	huelo ‘ilio, dog tail			x					
Dicot	Caryophyllaceae	*Drymaria cordata* var. *pacifica* M.Mizush.	X	pipili, pilipili	x	x	x		x			
Dicot	Convolvulaceae	*Ipomoea triloba* L.	X	little bell					x			
Dicot	Euphorbiaceae	*Aleurites moluccana* (L.) Willd.	P	kukui, kuikui, candlenut			x	x				
Dicot	Euphorbiaceae	*Euphorbia hyssopifolia* L.	X	spurge					x	x		
Dicot	Euphorbiaceae	*Phyllanthus debilis* Klein ex Willd.	X	niruri						x		
Dicot	Fabaceae	*Caesalpinia decapetala* (Roth) Alston	X	wait-a-bit, Mysore thorn	x	x						
Dicot	Fabaceae	*Chamaecrista nictitans* subsp. *patellaria* var. *glabrata* (Vogel) H.S.Irwin & Barneby	X	partridge pea		x	x	x				
Dicot	Fabaceae	*Desmodium* spp.	X		x		x					
Dicot	Fabaceae	*Desmodium triflorum* (L.) DC.	X	tick trefoil, tick clover	x		x	x	x		x	x
Dicot	Fabaceae	*Falcataria moluccana* (Miq.) Barneby & J.W.Grimes	X		x	x					x	x
Dicot	Fabaceae	*Macroptilium atropurpureum* (DC.) Urb.	X						x			
Dicot	Fabaceae	*Mimosa pudica* var. *unijuga* (Duchass. & Walp.) Griseb.	X	sensitive plant, sleeping grass				x		x	x	
Dicot	Lamiaceae	*Hyptis pectinata* (L.) Poit.	X	comb hyptis	x							
Dicot	Lauraceae	*Persea americana* Mill.	X	avocado					x	x		
Dicot	Lythraceae	*Cuphea carthagenensis* (Jacq.) J.F.Macbr.	X	tarweed, Colombian cuphea	x	x	x	x	x			x
Dicot	Malvaceae	*Hibiscus tiliaceus* L.	I	hau	x			x	x	x		
Dicot	Malvaceae	*Hibiscus waimeae*	E	kokiʻo keʻokeʻo, kokiʻo kea	x							
Dicot	Malvaceae	*Malvaviscus penduliflorus* DC.	X	Turk's cap, aloalo pahūpahū						x		
Dicot	Melastomataceae	*Clidemia hirta* var. *hirta*	X	Koster's curse	x	x	x	x	x	x	x	x
Dicot	Melastomataceae	*Melastoma septemnervium* Lour.	X		x	x		x	x			
Dicot	Melastomataceae	*Pterolepis glomerata* (Rottb.) Miq.	X								x	
Dicot	Meliaceae	*Melia azedarach* L.	X	chinaberry, pride-of-India	x							

Superfamily	Family	Scientific Name and Authorship	Status	Common Name	Blue Hole Diversion	Waikoko Diversion	Ili‘ili‘ula Diversion	Upper Hydro Forebay	Lower Waiahi Hydro Intake	Upper Hydro Powerhouse	Lower Hydro Forebay	Lower Waiahi Power Plant
Dicot	Myrsinaceae	*Ardisia elliptica* Thunb.	X	shoebutton ardisia						x		
Dicot	Myrtaceae	*Metrosideros polymorpha*	E	‘ōhi‘a, ‘ōhi‘a lehua	x	x	x	x	x	x		x
Dicot	Myrtaceae	*Psidium cattleianum* Sabine	X	strawberry guava	x	x	x	x		x	x	
Dicot	Myrtaceae	*Psidium guajava* L.	X	common guava	x	x	x	x	x	x		
Dicot	Myrtaceae	*Syzygium malaccense* (L.) Merr. & L.M.Perry	P	‘ōhi‘a ‘ai, mountain apple	x		x					
Dicot	Onagraceae	*Ludwigia octovalvis* (Jacq.) P.H.Raven	P?	primrose willow	x	x	x	x		x		
Dicot	Plantaginaceae	*Plantago major* L.	X	broad-leaved plantain, laukahi	x		x					
Dicot	Polygalaceae	*Polygala paniculata* L.	X	milkwort	x	x		x		x	x	x
Dicot	Rosaceae	*Eriobotrya japonica* (Thunb.) Lindl.	X	loquat								x
Dicot	Rosaceae	*Malus* sp.	X*	apple								x
Dicot	Rosaceae	*Prunus persica* (L.) Batsch	X	peach								x
Dicot	Rosaceae	*Rubus argutus* Link	X	prickly Florida blackberry	x							
Dicot	Rubiaceae	*Richardia scabra* L.	X		x	x	x	x	x	x	x	x
Dicot	Sapotaceae	*Chrysophyllum oliviforme* L.	X	satinleaf					x		x	x
Dicot	Scrophulariaceae	*Bacopa monnieri* (L.) Wettst.	I	‘ae‘ae (Ni‘ihau)					x			
Dicot	Scrophulariaceae	*Lindernia crustacea* (L.) F.Muell.	X	false pimpernel	x							
Dicot	Urticaceae	*Pilea microphylla* (L.) Liebm.	X	artillery plant, rockweed	x	x		x		x	x	x
Dicot	Urticaceae	*Pipturus albidus* (Hook. & Arn.) A.Gray	E	māmaki	x		x					
Dicot	Verbenaceae	*Lantana camara* L.	X	lantana	x	x	x					
Dicot	Verbenaceae	*Stachytarpheta cayennensis* (Rich.) Vahl	X	ōwï	x							
Gymnosperm	Cupressaceae	*Juniperus bermudiana* L.	X									x
Monocot	Agavaceae	*Cordyline fruticosa* (L.) A.Chev.	P	kï, ti	x	x	x			x	x	x
Monocot	Araceae	*Colocasia esculenta* (L.) Schott	P	kalo, taro	x		x	x				
Monocot	Araceae	*Epipremnum pinnatum* (L.) Engl.	X	pothos, golden pothos	x							
Monocot	Arecaceae	*Cocos nucifera* L.	P	niu, coconut					x			x
Monocot	Commelinaceae	*Commelina diffusa* Burm.f.	X	honohono wai, dayflower	x		x	x		x	x	
Monocot	Cyperaceae	*Cyperus involucratus* Rottb.	X	umbrella sedge			x					
Monocot	Cyperaceae	*Cyperus meyenianus* Kunth	X	Meyen's flatsedge	x		x			x		
Monocot	Cyperaceae	*Cyperus rotundus* L.	X	nut grass	x	x	x	x		x	x	
Monocot	Cyperaceae	*Fimbristylis dichotoma* (L.) Vahl	I					x				
Monocot	Cyperaceae	*Kyllinga brevifolia* Rottb.	X	kili‘o‘opu, kaluhā, manunēnē, mau‘u mokae						x		x
Monocot	Cyperaceae	*Machaerina angustifolia* (Gaudich.) T.Koyama	I	‘uki			x					
Monocot	Heliconiaceae	*Heliconia latispatha* Benth.	X		x							
Monocot	Musaceae	*Musa* hybrid	X*	banana, apple banana	x					x	x	
Monocot	Orchidaceae	*Arundina graminifolia* (D.Don) Hochr.	X	bamboo orchid				x				
Monocot	Orchidaceae	*Phaius tankarvilleae* (Banks ex L'Hér.) Blume	X	Chinese ground orchid, nun's orchid, nun's-hood			x					
Monocot	Pandanaceae	*Freycinetia arborea* Gaudich.	I	‘ie‘ie	x	x	x					
Monocot	Poaceae	*Andropogon bicornis* L.	X	barbas de indio				x			x	

Superfamily	Family	Scientific Name and Authorship	Status	Common Name	Blue Hole Diversion	Waikoko Diversion	Ili‘ili‘ula Diversion	Upper Hydro Forebay	Lower Waiahi Hydro Intake	Upper Hydro Powerhouse	Lower Hydro Forebay	Lower Waiahi Power Plant
Monocot	Poaceae	*Axonopus fissifolius* (Raddi) Kuhlm.	X	narrow-leaved carpetgrass			x	x	x	x	x	x
Monocot	Poaceae	*Chloris barbata* Sw.	X	swollen fingergrass						x		
Monocot	Poaceae	*Coix lachryma-jobi* L.	X	Job's-tears	x	x			x			
Monocot	Poaceae	*Echinochloa crusgalli* (L.) P.Beauv.	X	barnyard grass			x	x		x	x	
Monocot	Poaceae	*Oplismenus hirtellus*	X	basketgrass	x	x	x					
Monocot	Poaceae	*Paspalum conjugatum* P.J.Bergius	X	Hilo grass	x						x	
Monocot	Poaceae	*Paspalum dilatatum* Poir.	X	dallis grass	x				x		x	
Monocot	Poaceae	*Phyllostachys nigra* var. *henionis* (Mitford) Stapf ex Rendle	X	black bamboo	x		x		x	x	x	x
Monocot	Poaceae	*Sacciolepis indica* (L.) Chase	X	Glenwood grass	x	x		x				
Monocot	Poaceae	*Setaria verticillata* (L.) P.Beauv.	X	bristly foxtail	x	x						
Monocot	Poaceae	*Sporobolus indicus* (L.) R.Br.	X	West Indian dropseed, smutgrass	x							
Monocot	Poaceae	*Urochloa maxima* (Jacq.) R.D.Webster	X	Guinea grass	x		x	x	x			
Monocot	Zingiberaceae	*Alpinia zerumbet* (Pers.) B.L.Burtt & R.M.Sm.	X	shell ginger						x		
Monocot	Zingiberaceae	*Hedychium coccineum* hybrid	X*	pink ginger	x							
Monocot	Zingiberaceae	*Hedychium coronarium* J.Kōnig	X	white ginger					x			x
Pteridophyte	Blechnaceae	*Sadleria cyatheoides* Kaulf.	E	‘ama‘u, ‘ama‘uma‘u	x	x						
Pteridophyte	Dennstaedtiaceae	*Microlepia strigosa* var. *strigosa*	I	palapalai, palai	x				x			
Pteridophyte	Dicksoniaceae	*Cibotium sp.*	E	hāpu‘u	x							
Pteridophyte	Elaphoglossaceae	*Elaphoglossum paleaceum* (Hook. & Grev.) Sledge	I	māku‘e	x							
Pteridophyte	Gleicheniaceae	*Dicranopteris linearis*	I	uluhe	x	x	x	x			x	x
Pteridophyte	Gleicheniaceae	*Dicranopteris linearis* f. *linearis*	I	uluhe, unuhe								
Pteridophyte	Gleicheniaceae	*Diplopterygium pinnatum* (Kunze) Nakai	E	uluhe lau nui		x			x			x
Pteridophyte	Marattiaceae	*Angiopteris evecta* (G.Forst.) Hoffm.	X	mule’s-foot fern, giant fern	x							
Pteridophyte	Nephrolepidaceae	*Nephrolepis cordifolia* (L.) C.Presl	I		x		x					
Pteridophyte	Ophioglossaceae	*Ophioglossum pendulum* L.	I	puapua moa, laukahi	x		x					
Pteridophyte	Polypodiaceae	*Phymatosorus grossus* (Langsd. & Fisch.) Brownlie	X	laua‘e, maile-scented fern	x		x		x		x	
Pteridophyte	Pteridaceae	*Adiantum raddianum* C.Presl	X		x	x	x		x			
Pteridophyte	Pteridaceae	*Pityrogramma austroamericana* Domin	X	goldfern, goldback fern	x							
Pteridophyte	Thelypteridaceae	*Cyclosorus parasiticus* (L.) Farw.	X			x	x	x	x			

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APPENDIX C

Endangered and Threatened Flora and Fauna Species (Federal and State) with the Potential to Occur in the Survey Areas

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
01EPIF00-2019-TA-0018

October 18, 2018

Mr. James H. Breeden
SWCA Environmental Consultants
1001 Bishop Street, Suite 2800
Honolulu, Hawaii 96813

Subject: KIUC Waiahi Hydropower Long-Term Water Lease Project, Kauai, Hawaii

Dear Mr. Breeden:

The U.S. Fish and Wildlife Service (Service) received your email on September 17, 2018, requesting a species list and guidance to reduce impacts on affected species and habitats for the proposed Kauai Island Utility Cooperative (KIUC) Waiahi hydropower long-term water lease project. This project is located at the North Fork Wailua River, Waikoko Stream, and north of Upper Waiahi Powerhouse. The proposed project will involve stream diversions, including installation of a diversion structure across the stream, a headgate, a ditch to convey diverted water to the hydroplant, and a sluice gate for water return downstream. This project would also include the installation or upgrade of gauging stations at Iliiliula Stream, the spillway at North Fork diversion, and Waikoko. The Service offers the following comments to assist you in your planning process so that impacts to trust resources can be avoided. Our comments are provided under the authorities of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

Based on the information in our database and records, including data provided by the Hawaii Biodiversity and Mapping Program, the following are threatened or endangered species that may occur or transit through the vicinity of your proposed project area: the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus)*; Newcomb's snail (*Erinna newcombi*); and endangered plants 'Ohe (*Joinvillea ascendens* var. *ascendens*); 'Akoko (*Euphorbia remyi* var. *kauaiensis);* Lihue Melicope (*Melicope paniculata);* Wahiawa bog dubautia *(Dubautia pauciflorula).*

Hawaiian hoary bat
The Hawaiian hoary bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or may not move away.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you consider incorporating the following applicable measure into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).

Newcomb's snail
Newcomb's snail is restricted to fast-flowing freshwater streams on Kauai, where it feeds on vegetation growing on submerged rocks. Threats to the species include reduced stream flow from drought, water diversion projects, or other natural and human causes; predation by introduced snails, flies, and aquatic species; and small population dynamics.

- The U.S. Fish and Wildlife Service Recommended Standard Best Management Practices for Work in Aquatic Environments (enclosed) should be incorporated into the project description to minimize the degradation of water quality and impacts to fish and wildlife resources.
- Permits are required for accurate surveys of this species, so consult with the Service if work will be done in proximity to stream areas or within water bodies.

Project activities may affect listed plant species by causing physical damage to plant parts (roots, stems, flowers, fruits, seeds, etc.) as well as impacts to other life requisite features of their habitat which may result in reduction of germination, growth and/or reproduction. Cutting and removal of vegetation surrounding listed plants has the potential to alter microsite conditions (e.g., light, moisture, temperature), increase the risk of invasion by nonnative plants which can result in higher incidence or intensity of fire. Activities such as use of construction equipment, vehicles, and increased human traffic (i.e. trails, visitation, monitoring), can cause ground disturbance, erosion, and/or soil compaction which decrease absorption of water and nutrients and damage plant root systems and may result in reduced growth and/or mortality of listed plants. Soil disturbance or removal has the potential to negatively impact the soil seed bank of listed plant species if such species are present or historically occurred in the project area.

Listed plant species or designated critical habitat:
Minimize potential adverse effects to listed plants that may occur on the proposed project site by minimizing disturbance outside of existing developed or otherwise modified areas. When disturbance outside existing developed or modified sites is proposed, conduct a botanical survey for listed plant species within the project action area, defined as the area where direct and indirect effects are likely to occur. Surveys should be conducted by a knowledgeable botanist with documented experience in identifying native Hawaiian and Pacific Islands plants, including listed plant species. Botanical surveys should optimally be conducted during the wettest part of the year (typically October to April) when plants and identifying features are more likely to be visible, especially in drier areas. If surveys are conducted outside of the wet season, the Service may assume plant presence.

The boundary of the area occupied by listed plants should be marked with flagging by the surveyor. To avoid or minimize potential adverse effects to listed plants, we recommend adherence to buffer distances for the activities in the **Table below**. Where disturbed areas do not need to be maintained as an open area, restore disturbed areas using native plants as appropriate for the location.

If listed plants occur in a project area, the avoidance buffers are recommended to reduce direct and indirect impacts to listed plants from project activities. However, where project activities

will occur within the recommended buffer distances, additional consultation is required. The impacts to the plants of concern within the buffer area may be reduced by placing temporary fencing or other barriers at the boundary of the disturbance, as far from the affected plants as practicable.

The above guidelines apply to areas outside of designated critical habitat. If project activities occur within designated critical habitat unit boundaries, additional consultation is required.

All activities, including site surveys, risk introduction of nonnative species into project areas. Specific attention needs to be made to ensure that all equipment, personnel and supplies are properly checked and are free of contamination (weed seeds, organic matter, or other contaminants) before entering project areas. Quarantines and or management activities occurring on specific priority invasive species proximal to project areas need to be considered or adequately addressed. This information can be acquired by contacting local experts such as those on local invasive species committees (Kauai: http://www.kauaiisc.org/; Oahu: http://www.oahuisc.org/; Maui Nui: http://mauiinvasive.org/; and Hawaii: http://www.biisc.org/).

Table 1. Recommended buffer distances for to minimize and avoid potential adverse impacts to listed plants from activities listed below.

Action		**Buffer Distance (feet (meters)) - Keep Project Activity This Far Away from Listed Plant**	
		Herb/Shrub	**Tree**
Cutting and Removing Vegetation By Hand or Hand Tools (e.g., weeding)		3 ft (1 m)	3 ft (1 m)
Mechanical Removal of Individual Plants or Woody Vegetation (e.g., chainsaw, weed eater)		3 ft up to height of removed vegetation (whichever greater)	3 ft up to height of removed vegetation (whichever greater)
Removal of Vegetation with Heavy Equipment (e.g., bulldozer, tractor, "bush hog")		2x width equipment + height of vegetation	820 ft (250 m)
Use of Approved Herbicides (following label)	**Hand Application (spot treatment)**	10 ft (3 m)	Crown diameter
	Ground-based Spray Application (e.g. backpack, tank sprayer)	50 ft (15 m)	250 ft (76 m)
	Aerial Spray (ball applicator)	250 ft (76 m)	250 ft (76 m)
	Aerial Application (paintball)(individual plant treatment)	100 ft (30 m)	100 ft (30 m)
	Aerial Spray (boom)	Further consultation required	Further consultation required

Ground/Soil Disturbance/Outplanting/Fencing (Hand tools, e.g. shovel, `ō`ō; Small mechanized tools, e.g., auger)		20 ft (3 m)	2x crown diameter
Ground/Soil Disturbance (Heavy Equipment)		328 ft (100 m)	820 ft (250 m)
Surface Hardening/Soil compaction	**Trails (e.g., human, ungulates)**	20 ft	2x crown diameter
	Roads/Utility Corridors, Buildings/Structures	328 ft (100 m)	820 ft (250 m)
Prescribed Burn/Fires		Further consultation required	Further consultation required

If additional information becomes available, or it is determined that the proposed project may affect federally listed species, we recommend you coordinate further with our office so that we may assist you with ESA compliance. We appreciate your efforts to conserve endangered species. If you have questions regarding this response, please contact Narrissa Spies, Fish and Wildlife Biologist (phone: 808-792-9400, email: narrissa_spies@fws.gov). When referring to this project, please include this reference number: 01EPIF00-2019-TA-0018.

Sincerely,

Acting Island Team Manager
Oahu, Kauai, Northwestern Hawaiian
Islands and American Samoa

Enclosure: Service's BMPS for Work in Aquatic Environments

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service (USFWS) recommends the following measures to be incorporated into project planning to avoid or minimize impacts to fish and wildlife resources. Best Management Practices (BMPs) include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to aquatic habitats that result from project construction-related activities. These BMPs are recommended in addition to, and do not over-ride any terms, conditions, or other recommendations prepared by the USFWS, other federal, state or local agencies. If you have questions concerning these BMPs, please contact the USFWS Aquatic Ecosystems Conservation Program at 808-792-9400.

1. Authorized dredging and filling-related activities that may result in the temporary or permanent loss of aquatic habitats should be designed to avoid indirect, negative impacts to aquatic habitats beyond the planned project area.

2. Dredging/filling in the marine environment should be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods. Because these periods are variable throughout the Pacific islands, we recommend contacting the relevant local, state, or federal fish and wildlife resource agency for site specific guidance.

3. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.

4. All project construction-related materials and equipment (dredges, vessels, backhoes, silt curtains, etc.) to be placed in an aquatic environment should be inspected for pollutants including, but not limited to; marine fouling organisms, grease, oil, etc., and cleaned to remove pollutants prior to use. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats. Implementing both a litter-control plan and a Hazard Analysis and Critical Control Point plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) can help to prevent attraction and introduction of non-native species.

5. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to aquatic habitats and should be protected from erosion (*e.g.*, with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.

6. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

7. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

19379

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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CONSERVATION AND COASTAL LANDS
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ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
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DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

DEC 2 1 2018

Mr. John Breeden
SWCA Environmental Consultants
Bishop Square ASB Tower
1001 Bishop Street, Suite 2800
Honolulu, Hawaii 96813

Dear Mr. Breeden:

This letter is in response to your September 17, 2018 letter request for a wildlife and plant species list for the proposed Kaua'i Island Utility Cooperative's Waiahi Hydropower Long-Term Water Lease Project on Kaua'i, Hawai'i. Pursuant to your request and using the project locations provided in the letter and as GIS files, below are State and Federal listed threatened and endangered species that may be in the vicinity of the proposed project area. Also included are recommended wildlife avoidance procedures.

Please note that these are preliminary recommendations prior to any specific knowledge of the project actions. Site-specific surveys for rare, threatened, and endangered species that may occur in the project area are needed. DOFAW understands that the project will be subject to Hawai'i Revised Statutes 343 and we may have additional comments upon review of documents submitted per statutory requirements. If there are impacts anticipated to State listed species a Habitat Conservation Plan and associated Incidental Take License will be required.

Hawaiian Hoary Bat

The 'Ōpe'ape'a or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) can be found throughout Kaua'i, with a range encompassing the Līhu'e-Kōloa Forest Reserve, Department of Hawaiian Home Lands, Grove Farm LLC lands, and Kekaha Agriculture Association lands.

Hawaiian Hoary Bats roost in both native and non-native woody plants, primarily trees. The breeding and pup-rearing season is from June 1 to September 15. To minimize impacts or disturbance to bats, we recommend the following:

1. Avoid pruning or removing trees greater than 15 feet (4.6 meters) tall during the breeding and pup-rearing season.
2. If trees taller than 15 feet must be removed, this should be done during the non-breeding and non-pupping season from September 16 to May 31.

Hawaiian Waterbirds and Hawaiian Goose

The 'Alae 'ula or Hawaiian Common Moorhen or Gallinule (*Gallinula galeata sandvicensis*) and the Koloa moali or Hawaiian Duck (*Anas wyvilliana*) are known to occasionally use the stream and irrigation ditches in the project vicinity, primarily for feeding. There are no records of nesting within the proposed project sites.

While the nesting seasons for these species are generally during the summer months, nesting may occur as early as April and as late as mid-September. To minimize impacts or disturbance to these species, we recommend construction occur during the non-nesting season from late September to March. Please note the Hawaiian Duck has been observed to nest as early as March after heavy rains.

The following are guidelines to minimize disturbance and impacts to listed waterbirds and the Hawaiian Goose, or Nēnē (*Branta sandvicensis*):

1. A knowledgeable wildlife biologist should conduct listed bird and nest surveys at the proposed project sites at least two weeks prior to the start of construction.
2. Subsequent surveys may be needed weekly if there are delays during the construction phase of the project. The biologist should be present during all construction phases to ensure listed birds and nests are not impacted.
3. Should an active nest be discovered in the project site (including reservoirs, ditches, and drains), the project shall be delayed until the chicks or ducklings have fledged the area.
4. Should a listed bird be observed within, or fly into, the project site during work, construction activities within 100 feet of the bird should halt until the bird leaves the area.

Hawaiian Seabirds

These nocturnally active listed species are not known to nest within the proposed project area; however, these species traverse over the project sites to and from their mountain nesting grounds during the nesting season of April to September:

'Ua'u or Hawaiian Petrel (*Pterodroma sandwichensis*)
Newell's Shearwater (*Puffinus auricularis newelli*)
Band-rumped Storm Petrel (*Oceanodroma castro*)

During the fledging season from September 15 to December 15, young seabirds on their maiden flights become attracted to bright lights or artificially-lighted areas. Some birds become disoriented and exhausted causing them to fall to the ground or strike utility structures and buildings. Once on the ground, they are vulnerable to predators and being struck by vehicles along roads.

To minimize impacts to listed seabirds, please note the following:

1. During the seabird fledging season, nighttime construction work using lights should be avoided.
2. For nighttime construction work that must occur from December 16 to September 14, construction lights shall be fully shielded and pointed downward. Construction lights

shall not be point upward. This is to avoid adult seabirds from being attracted to the construction sites.

At any time during the construction phase, should a listed wildlife species be reported sick, injured, or dead, please notify the DOFAW Kaua'i office at (808) 274-3433 or Thomas Ka'iakapu at (808) 645-1576.

A post-construction report shall be submitted to the DOFAW Kaua'i office within 30 days of the completion of the project. The report shall include all wildlife surveys, observations, and monitoring reports, wildlife incidents, and the date, time, and location of each incident. The report shall also include photos of the sites before, during, and after the construction project is completed.

Listed and Rare Plants

The watersheds within which the project and its diversions are planned to occur contain many listed and rare plant species. Due to the mostly trail-less, steep, and heavily vegetated nature of the area, it is highly possible many rare and endangered species lie undetected within the watersheds, project area, and its arbitrary buffer.

The below species list, comprised of State and Federal listed endangered (E), threatened (T), or otherwise rare, including species of concern (SOC), plants, contains those known to occur in the project vicinity based on previous observations. Other listed plant species could be present.

Adenophorus periens L.E. Bishop (E)
Anoectochilus sandvicensis Lindl. (SOC)
Cyanea asarifolia H. St. John (E)
Cyanea dolichopoda Lammers & Lorence (E)
Cyanea recta (Wawra) Hillebr. (T)
Cyanea remyi Rock (E)
Cyrtandra heinrichii H. St. John (SOC)
Cyrtandra kamoolaensis H. St. John (SOC)
Cyrtandra kealiae subsp. *kealiae* (T)
Cyrtandra oenobarba H. Mann (E)
Dubautia pauciflorula H. St. John & G.D. Carr (E)
Dubautia plantaginea subsp. *magnifolia* (Sherff) G.D. Carr (E)
Euphorbia remyi var. *kauaiensis* O. Deg. & Sherff (E)
Euphorbia remyi var. *remyi* (E)
Eurya sandwicensis A. Gray (SOC)
Hibiscus kokio subsp. *kokio* (syn. H. kahili) (SOC)
Isodendrion longifolium A. Gray (T)
Labordia lydgatei C.N. Forbes (E)
Labordia tinifolia var. *wahiawaensis* H. St. John (E)
Lysimachia filifolia C.N. Forbes & Lydgate (E)
Lysimachia iniki K.L. Marr (E)
Lysimachia pendens K.L. Marr (E)
Melicope paniculata (H. St. John) T.G. Hartley & B.C. Stone (E)
Microsorum spectrum var. *pentadactylum* (Hillebr.) D.D. Palmer (rare)
Plantago princeps var. *longibracteata* H. Mann (E)

Platydesma rostrata Hillebr. (E)
Polyscias flynnii (Lowry & K.R. Wood) Lowry & G.M. Plunkett (E)
Pritchardia flynnii Lorence & Gemmill (SOC)
Pritchardia hardyi Rock (E)

If you have any questions about this list or the species on it, please contact Adam Williams at (808) 639-3827 or Adam.M.Williams@hawaii.gov.

For critical habitat designations of listed species, please contact the U.S. Fish and Wildlife Service Pacific Islands Office, as this falls under its jurisdiction.

Sincerely,

for DAVID G. SMITH
Administrator

APPENDIX D

Newcomb's Snail Survey

MEMO

Department of the Interior
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office

ROUTING	DATE: 3-12-18
1. Greg Koob - Conservation and Restoration Program Manager 2. Michelle Clark - PIFWO Kauai Island Team Biologist 3. File	SUBJECT: Trip Report - Makaleha Stream, Makaleha Springs, and North Fork Wailua Stream, Kauai

FROM: Gordon Smith	FWS-PIFWO, Honolulu	(808) 792-9457

Makaleha Stream at the site of Makaleha Spring and the North Fork Wailua River in the vicinity of the `Ili`iliula ditch diversions (the "Blue Hole diversion") were surveyed for the presence of *Errina newcombi* (Newcomb's snail) on March 6 and 7, 2018. Weather and hydrologic patterns were typical of winter/spring conditions with intermittent showers and episodic high flows in the weeks prior to field visits (Figure 1).

The purpose of the survey was as follows:

1. Makaleha Stream and Spring - this is location is described in previous FWS reports as a known location with an extant population of Newcomb's snail. The most recent FWS survey was in 2003 and field notes indicate that "few" snails were observed. The intent of the survey was to relocate the population and if possible obtain digital photographs of snails in-situ, as well as photomicrographs of egg masses which apparently have not been previously documented.

2. North Fork Wailua River, `Ili`iliula ditch diversion - Mike Kido of the Hawaii Stream Research Center reported snails at an unspecified location upstream of this diversion in 1995. Based on that report, critical habitat for Newcomb's snail was designated immediately upstream of the diversion and extends to the headwaters of the stream. Snails have not been observed at this location in subsequent surveys despite several visits to the area by FWS biologists and others. The intent of the survey was to thoroughly examine the stream channel and adjacent tributaries to confirm the presence of snails in this reach of the N. Fork Wailua River.

Results and observations:

1. Makaleha Springs consists of several large springs that originate from a boulder-and-bedrock-covered hillside that is heavily vegetated. All of the tributary spring channels were searched for snails for approximately two hours. Only two juvenile-sized individuals were found. The snails were located within a crevice and could not be successfully photographed. Three Hester-Dendy artificial substrate plates were installed in the vicinity of the snails (Figure 2). If snails move onto the artificial substrate plates they can be safely removed from the water to better observe and photograph snails and egg masses. A follow-up visit to the site in late April or early May is recommended.

2. The North Fork Wailua River was surveyed approximately 500m upstream and 500m downstream of the diversion over a four-hour timeperiod (Figure 3). In addition, all seven of the smaller valley wall tributaries encountered were thoroughly examined from 50m to 300m up-gradient from their confluence with the main channel. The survey effort extended from about 10am to 2pm with a short break for lunch. No snails were observed.

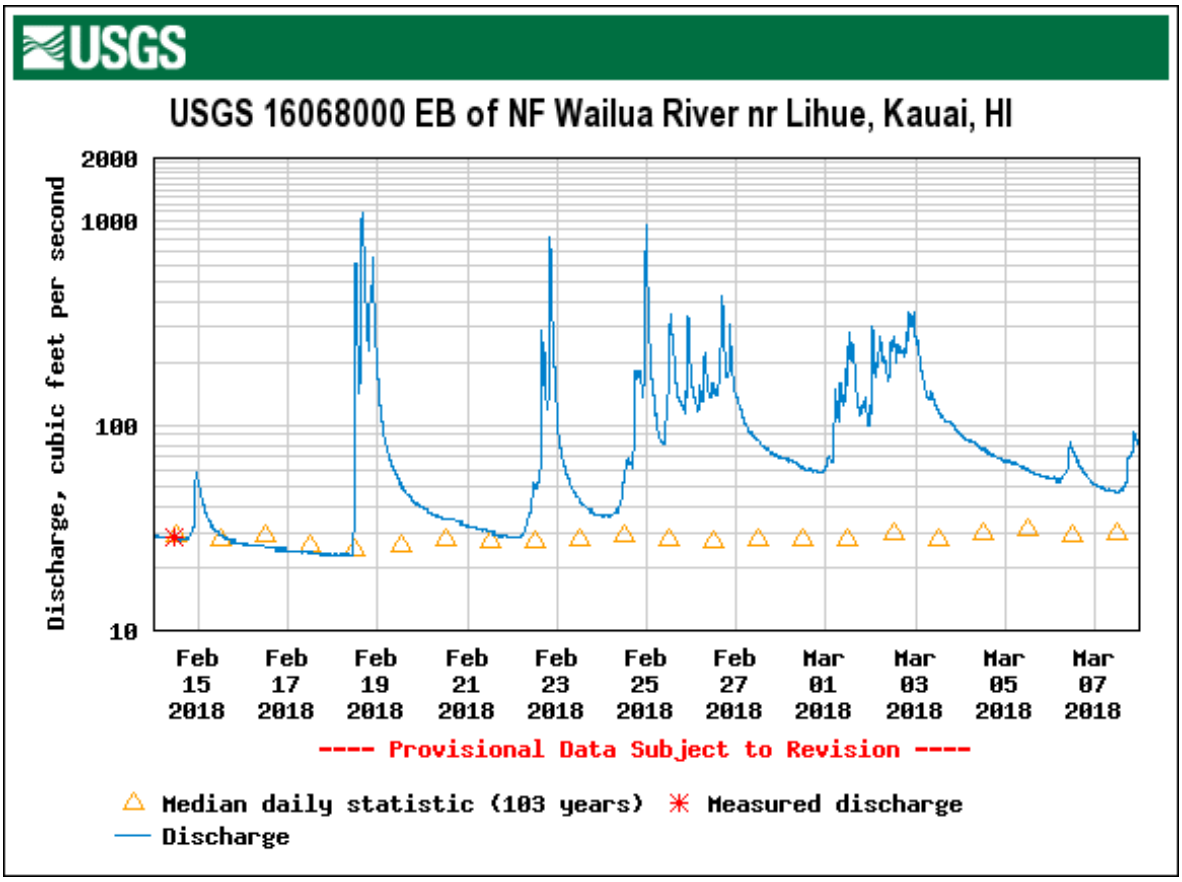

Figure 1. Daily discharge at the N. Fork Wailua River guage indicating episodic high flows in the two weeks prior to survey dates.

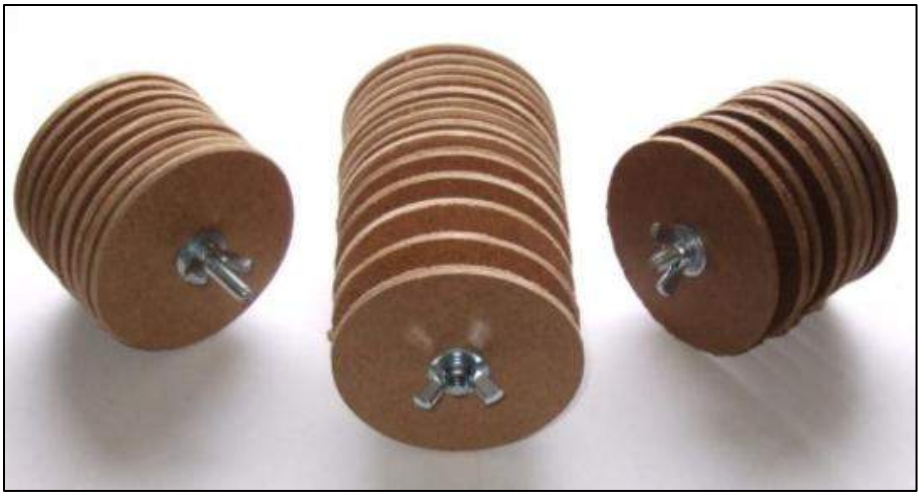

Figure 2. Hester-Dendy artificial substrate samplers

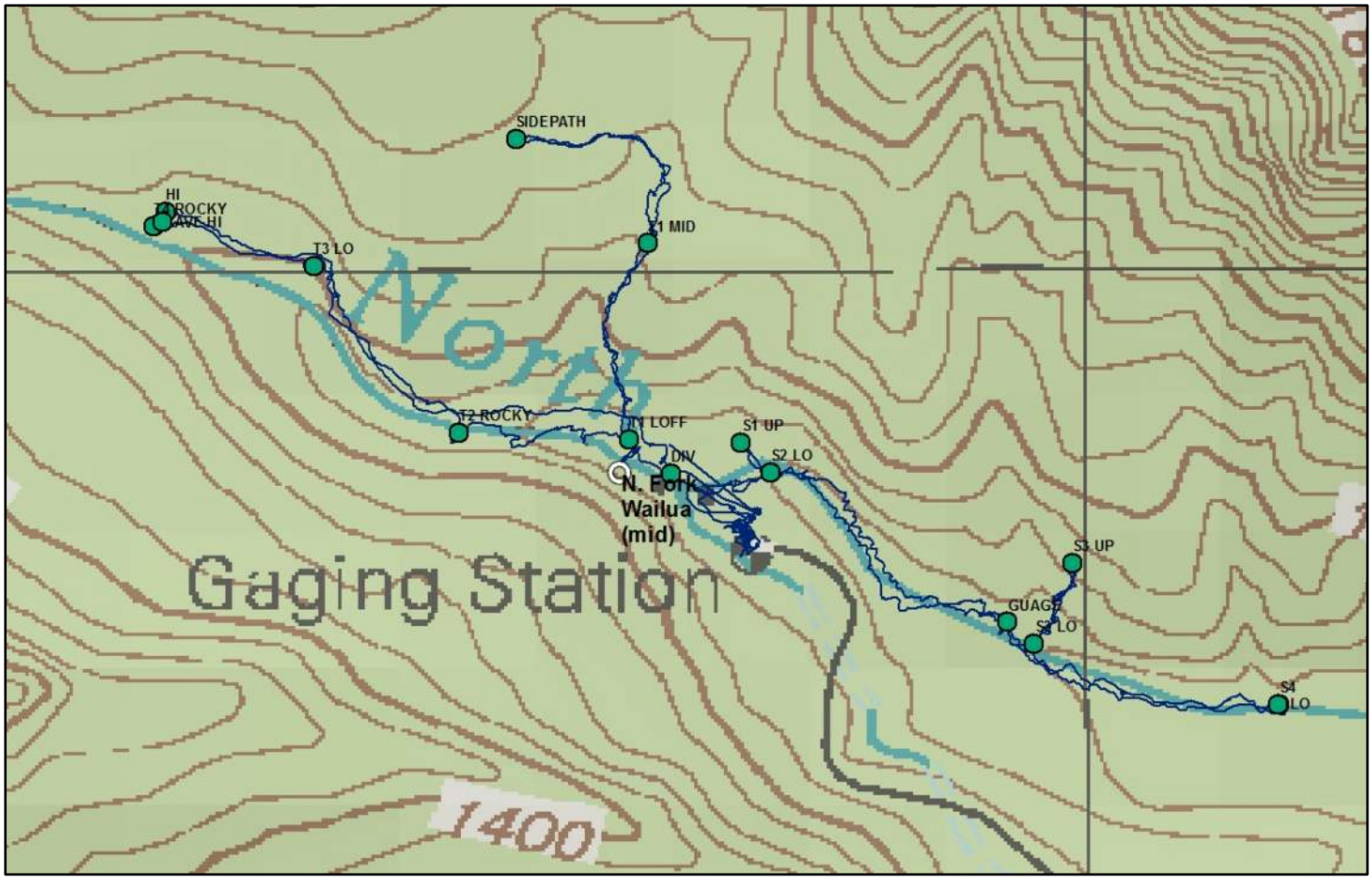

Figure 3. GPS tracklog and waypoints from Newcomb's snail survey in the vicinity of the "Blue Hole" diversion. Waypoints indicate small tributary streams entering main channel.

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APPENDIX D
Stream Habitat Assessment

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Assessment of Stream Diversions associated with the Upper and Lower Waiahi Hydropower System using the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) Model

5/29/2019

Prepared for:

Kaua'i Island Utility Cooperative

Submitted By:

James E. Parham, Ph.D.

TRUTTA Environmental Solutions, LLC

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ABSTRACT

Kauaʻi Island Utility Cooperative (KIUC) operates the Upper and Lower Waiahi Hydroelectric Plants in the Wailua River Watershed and is currently seeking to convert from an annual revocable permit (RP) to a 65-year lease to divert water at the North Fork and Waikoko diversions (referred to collectively in the RP as the Blue Hole Diversion). In 2013, the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) model was used to assess the environmental impacts of the Upper and Lower Waiahi Hydroelectric Plants on the native stream animals and their habitats. The final report for that project was as follows:

Parham, J.E. 2014. Assessment of the environmental impact of the Upper and Lower Waiahi Hydroelectric Plants on the native stream animals with respect to habitat changes, barriers to migration, and entrainment using the GIS model-based Hawaiian Stream Habitat Evaluation Procedure. Kauaʻi Island Utility Cooperative. 309 p.

In 2018, Trutta Environmental Solutions, LLC (TRUTTA) was contracted to update the HSHEP assessment of impact to native species habitat associated with the Upper and Lower Waiahi Hydroelectric Plants. The assessment update included a survey of instream habitat and biota, a seepage run in North Fork of the Wailua River (NF Wailua) and Waikoko Streams and the results integration into the HSHEP model to update the results for the native amphidromous stream animals (5 fish, 2 crustaceans and 1 mollusk).

The updated Upper and Lower Waiahi Hydropower Diversion HSHEP model for the upper tributary streams of the Wailua River addresses four proposed scenarios associated with the hydropower diversion system. The first two scenarios are intended to estimate minimum and maximum impact conditions. These are the (1) No Diversion scenario which serves as an estimate of the minimum (no) impact to native stream animals' habitat and the (2) Full Diversion scenario which represents the maximum impact scenario for comparison. Two additional scenarios address specific project conditions. These include (3) Current Conditions scenario based on conditions we observed during the project surveys and (4) IIFS Flow Restoration scenario which reflects flow conditions described by the Interim Instream Flow Standards (IIFS) recommended by Commission on Water Resource Management (CWRM) staff.

To assess habitat availability, the High Definition Stream Survey™ (HDSS) method was used to collect, classify, and analyze the data required for this project. The High Definition Fish Survey (HDFS) approach was used to document biota in the survey segments. HDFS utilizes pole-mounted, high-definition, underwater video cameras to capture images of fish or other aquatic animals at a specific location. The focus of the habitat assessment was to document instream conditions above and below stream diversions to support the HSHEP model.

The surveys for the North and South Forks of the Wailua River were completed during the weeks of February 11-14, 2018 and June 12- 20, 2018. Eight general sampling areas were surveyed in the North Fork and nine areas in the South Fork. At most locations, we collected data on stream discharge, water quality, habitat condition and also documented species present. The following descriptions of the surveys will cover the North Fork sites first and then the South Fork sites.

The results of the new HSHEP model generally supported the conclusions of the past work in the Upper and Lower Waihi Hydropower impact area.

- Non-climbing amphidromous stream species – These species included ʻoʻopu naniha (*Stenogobius hawaiiensis*), ʻoʻopu akupa (*Eleotris sandvicensis*), and ʻōpae oehaʻa (*Macrobrachium grandimanus*) and were expected to be restricted to stream segments below the first major waterfall and no differences in Habitat Units were predicted among scenarios.
- Climbing amphidromous stream species excluding ʻōpae kalaʻole (*Atyoida bisulcata*) – The climbing amphidromous animals were predicted to have most of their habitat located far downstream of the Upper and Lower Waiahi Hydropower facilities.
- ʻŌpae kalaʻole (*Atyoida bisulcata*) - ʻŌpae kalaʻole (*Atyoida bisulcata*) was predicted to have the most habitat units in the area of the hydropower facilities. Our surveys showed robust populations of ʻōpae kalaʻole upstream of the North Fork, Waikoko, and Iliʻiliʻula Diversions. Additionally, we observed large numbers of ʻōpae kalaʻole within the diversion ditches and tunnels.
- Endangered Newcomb's snail - We actively looked for Newcomb snail during our biotic surveys, but none were observed.

Several general conclusions were drawn about the survey and modeling effort:

- The location of the Upper and Lower Waiahi Hydropower diversions at the backend of the watershed decreases its impact on native amphidromous stream animals.
- Waterfalls were barriers controlling native amphidromous stream animal distributions.
- Predation by smallmouth bass on native stream animals likely eliminated them from much of the stream segments.

Past study recommendations were supported by the additional work, including:

- Optimizing the location and amount of water diverted and designing permanent downstream water releases within the diversion system to maximize habitat and passage for ʻōpae kalaʻole (*Atyoida bisulcata*) while retaining current diversion quantities.
- Reducing entrainment of ʻōpae kalaʻole (*Atyoida bisulcata*) into the generation facilities to avoid mortality associated with passing through the turbines.
- Restoring low flow as delineated in the recommended IIFS will provide consistent water flow below the diversions and will increase suitable habitat, improve passage, and decrease entrainment for all species found in the vicinity of the diversions.

INTRODUCTION

Kaua‘i Island Utility Cooperative (KIUC) operates the Upper and Lower Waiahi Hydroelectric Plants in the Wailua River Watershed and is currently seeking to convert from an annual revocable permit to a 65-year lease for use of water at the North Fork and Waikoko diversions. In 2013, the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) model was used to assess the environmental impacts of the Upper and Lower Waiahi Hydroelectric Plants on the native stream animals and their habitats. That project was focused on assessing:

- loss of habitat as a result of the construction and operation of the Upper and Lower Waiahi Hydroelectric Plants,
- barriers to animal movement and migration,
- entrainment of animals in the hydroelectric facility, and
- site specific issues associated with Threatened & Endangered or recreationally important species.

The final report for the project was:

Parham, J.E. 2014. Assessment of the environmental impact of the Upper and Lower Waiahi Hydroelectric Plants on the native stream animals with respect to habitat changes, barriers to migration, and entrainment using the GIS model-based Hawaiian Stream Habitat Evaluation Procedure. Kaua‘i Island Utility Cooperative. 309 p.

In 2018, Trutta Environmental Solutions, LLC (TRUTTA) was contracted to update the HSHEP assessment of impact to native species habitat associated with the Upper and Lower Waiahi Hydroelectric Plants. The assessment update included a survey of instream habitat and biota, a seepage run in North Fork Wailua and Waikoko Streams and the results integration into the HSHEP model to update the results for the native amphidromous stream animals (5 fish, 2 crustaceans and 1 mollusk). Specifically, the fieldwork and modeling assessed issues associated with the stream diversions including loss of instream habitat from diversion of stream flow, creation of barriers to stream animal upstream movement, and the entrainment of downstream drifting larvae.

Changes to the naturally occurring stream habitat brought about by man’s modification of the environment may have a positive or negative effect on the quantity or distribution of a species’ suitable habitat. The HSHEP model was designed to quantify how various man-made changes affect native Hawaiian stream animals. Providing managers with the ability to assess change to native species habitat with respect to flow modifications, watershed development, or in-channel structures is important in understanding the positive or negative implications of various actions. The HSHEP model is intended to capture the major aspects of native stream animal ecology, the

typical geomorphology of Hawaiian streams, and common modifications to the environment within a single model.

The updated Upper and Lower Waiahi Hydropower Diversion HSHEP model for the upper tributary streams of the Wailua River addresses four proposed scenarios associated with the hydropower diversion system. The first two scenarios are intended to estimate minimum and maximum impact conditions. These are the (1) No Diversion scenario which serves as an estimate of the minimum (no) impact to native stream animals' habitat and the (2) Full Diversion scenario which represents the maximum impact scenario for comparison. Two additional scenarios address specific project conditions. These include (3) Current Conditions scenario based on conditions we observed during the project surveys and (4) IIFS Flow Restoration scenario which reflects flow conditions described by the Interim Instream Flow Standards (IIFS) recommended by Commission on Water Resources Management (CWRM) staff. The recommended IIFS has not been adopted by CWRM but is currently being implemented by KIUC. The results of these scenarios allow for the comparison and quantification of the changes in suitable habitat for native stream animals as a result of the proposed IIFS.

The HSHEP modeling approach applied on this project has been developed for, applied on, and critically reviewed for use in Hawaiian streams and used to assess the hydropower impact assessment on Wailua River, Kauaʻi (Parham 2014) in a past study. The HSHEP model approach also has been used extensively in Hawaiʻi , including for instream flow determinations on East and West Maui streams (Parham et al. 2009, Parham 2013a), and Waimea River, Kauaʻi (Higashi and Parham 2016), flood mitigation impact assessment on the Ala Wai Streams, Oʻahu (Parham 2015b, c, d) and other stream assessments across the state. In addition, the integrated field surveys and HSHEP approach underwent and passed formal professional review by the US Army Corps of Engineers (USACE) for its application on the Ala Wai Streams Flood Mitigation Project (Parham 2015a).

Goals

The primary goal of this project was to update past modeling results from the 2014 report for the native amphidromous stream animals' habitat in the streams associated with the Upper and Lower Waiahi Hydropower System.

Objectives

The HSHEP Model project on the Wailua River tributary streams focused on two main objectives: assessing and quantifying suitable habitat for (1) current project conditions and (2) CWRM staff recommended interim instream flow conditions.

To complete these objectives, the following steps were taken:

1. Conduct Field Surveys:

a. *Habitat Assessment*: Gather data on instream habitat using the High Definition Stream Survey (HDSS) method.

b. *Biotic Assessment:* Gather data on the populations of native amphidromous stream animals using the High Definition Fish Survey (HDFS).

c. *Discharge Assessment*: Conduct seepage runs on the North Fork of the Wailua River and Waikoko Stream, a tributary to the South Fork of the Wailua River.

2. *Modeling:* Run and document HSHEP model results to assess suitable habitat for native amphidromous stream animals associated with four scenarios:
   a. Scenario 1 - No Diversion: Quantify the amount and distribution of suitable habitat under undiverted stream conditions.
   b. Scenario 2 – Full Diversion: Quantify the amount and distribution of suitable habitat under full diversion conditions
   c. Scenario 3 – Current Conditions: Quantify the amount and distribution of suitable habitat under current survey conditions
   d. Scenario 4 – IIFS Flow Restoration: Quantify the amount and distribution of suitable habitat under CWRM staff recommended interim instream flow conditions

FIELD METHODS

Habitat Assessment

The focus of the habitat assessment was to document instream conditions above and below stream diversions to support the HSHEP model. To assess habitat availability, the High Definition Stream Survey™ (HDSS) method was used to collect, classify, and analyze the data required for this project. In general, the HDSS approach follows a standardized series of steps that promotes rapid, systematic collection and processing of large amounts of stream conditions information (Figure 1). The specifics of the data collected may vary with the project's requirements or site limitations but following the general HDSS process ensured a successful project.

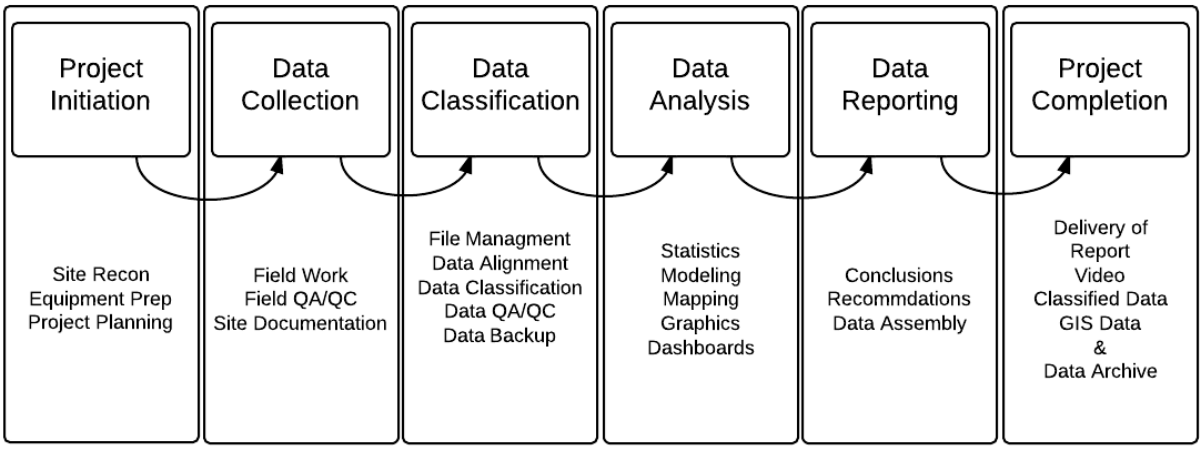


Figure 1:The standardized HDSS project flow chart.

Due to the narrow and shallow streams being surveyed, our backpack-mounted HDSS system was the primary data collection platform used during the surveys to collect habitat data. (Figure 2). At sites where the stream was too deep to wade, we swam through the site and collected data using a geo-referenced, underwater video camera. Data collection was contingent on water flow, so fieldwork timing was adjusted to avoid rain and high stream flows as much as possible.

Figure 2: Dr. Parham using Backpack HDSS on the North Fork of the Wailua River, Kauaʻi. The GPS-linked video cameras are image stabilized to dampen the bounces associated with walking in a stream. This picture also illustrates HDSS data collection in a riffle habitat type on the North Fork of the Wailua River. Note the small boulder substrate class.

The backpack-mounted HDSS system has the following capabilities:

- four-channel video recording (four utilized for this project)
- four separate 64 GB SDXC cards in an array of four video streams in four separate files
- four above-water cameras
    - forward facing
    - streambank left
    - streambank right
    - down looking for substrate classification
- Garmin GPS receiver with GLONASS capabilities and WAAS differential correction
- one- to three-meter ultimate accuracy
- optimized for speeds less than one mph.

Measures of water depth, habitat type, substrate, and stream width were collected as primary indicators of habitat availability. These variables were converted into suitability criteria based on the published habitat suitability criteria for the native amphidromous stream animals and used to create the estimates of overall habitat area for each species (Parham 2015d). In addition to the habitat variables measured, stream discharge and water quality were measured both upstream

and downstream of the diversion to document the proportion of the flow diverted and flowing downstream.

After the data was collected in the field, it was processed using HDSS Video Coder Software (Parham, 2014), Microsoft Access, Microsoft Excel, and ArcGIS. Data was classified for approximately each meter of the stream longitudinally. Given the primary goal of quantifying habitat, the following variables were classified:

- Water depth
- Habitat type (riffle, run, pool, side pool, plunge pool, cascade, or falls)
- Primary substrate size class (using Modified Wentworth Substrate Classification System – fine, sand, gravel, cobble, small boulder, large boulder and bedrock)
- Percent wetted stream width
- Presence of stream channel modifications

Water Depth

The Water Depth category captured the thalweg depth for the main flow of the stream channel. The thalweg can be considered the center of the main flow and is usually the deepest depth across the stream channel. The wading poles (which can be seen in the down-looking video) are set at 1 ft. at the first black joint and 2 ft. at the second joint for reference for the classifier. In deeper sections, verbal documentation of depths by the surveyors was noted for reference. The water depth was classified according to the following categories: Dry, < 1 inch, 1-3 inches, 3-6 inches, 6-12 inches, 12-24 inches, 24-36 inches (2-3 ft. deep), 36+ inches (>3 ft. deep), and Unknown.

Habitat Type

Habitat type is one of the primary measures in describing instream habitat and was classified as riffle, run, pool, side pool, plunge pool, cascade, pocket water, or falls from the assembled HDSS video, primarily concentrated on the forward view. Figure 2 shows an example of a HDSS collection in a riffle habitat type. Habitat types change depending on amount of water in a river.

In general, the habitat types classified from the HDSS videos were compatible with those habitat types used by the Hawaiʻi Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR) in their habitat and fish surveys. One additional class (pocket water) was added which represents a mix of riffle, run, and small pool habitat commonly found in the mid to upper reaches of the stream. Transitions from one habitat type to the other were visually evaluated by an experienced classifier.

Substrate

Substrate is a typical classification variable in habitat suitability studies. The observed substrate is primarily determined by high flow events. The high flow events have enough power to move

boulders and scour out pools and redistribute the sediment in downstream locations. Substrate types included were fine sediment, sand, gravel, cobble, boulders and bedrock. As with all the variables, we used categories consistent with DAR in their habitat and fish surveys.

Stream Width

The stream width was determined by visual classification using the HDSS video. The stream width and wetted width was measured to better determine the area of the habitat units observed from the imagery.

BIOTIC SURVEYS

High-Definition Fish Surveys (HDFS)

The High Definition Fish Survey (HDFS) approach was used to document biota in the survey segments. HDFS utilizes pole-mounted, high-definition, underwater video cameras to capture images of fish or other aquatic animals at a specific location (Figure 3). The underwater cameras are geo-referenced so that specific time and place information is recorded in conjunction with all video observations.

In general, the HDFS sample was considered a point or timed sample. The cameras were moved into position, slowly lowered to the bottom, and then left in position for approximately 30 seconds to capture a sample of animals at that location (Figure 4). In some locations, the camera was moved slowly to the next position without removing it from the water. This process was repeated at sites distributed evenly throughout the available habitat. In locations where it was too deep and wide to wade a stream, we snorkeled the stream with a hand-held video camera on a 3 ft pole. This allowed us to gather a visual record of the habitat and species present that could be processed in a similar method to the other HDFS approach. The HDFS approach has been used throughout streams in Hawaiʻi to observe many different species (Figure 5).

To document the animals observed in the videos, the HDSS Video Coder software with a list of potential animal species was used. Additional species, if observed, were listed as Other1, -2, or -3 and then identified after the classification process. This allowed a single standard classification approach to be used for all survey video. The potential Hawaiian Stream species list included:

Native Fishes: ʻOʻopu nakea (*Awaous stamenius*), ʻOʻopu naniha (*Stenogobius hawaiiensis*), ʻOʻopu nōpili (*Sicyotperus stimpsoni*), ʻOʻopu alamoʻo (*Lentipes concolor*) ʻOʻopu akupa (*Eleotris sandvicensis*), Aholehole (*Kuhlia xenura*), Mullet (*Mugil cephalus*)

Native Crustaceans and Mollusks: ʻŌpae oehaʻa (*Macrobrachium grandimanus*), ʻŌpae kalaʻole (*Atyoida bisulcata*), Hihiwai *(Neritina granosa*), Hapawai (*Neritina vespertina*), Newcomb's snail (*Erinna newcombi*)

Introduced Fishes: Armored Catfish (*Hypostomus c.f. watawata)*, Bristlenose Catfish (*Ancistrus c.f. temmincki*), Bronze Corydoras (*Corydoras aeneus),* Liberty Molly (*Poecilia sp. hybrid complex)*, Green Swordtail (*Xiphophorus hellerii)*, Guppy (*Poecilia reticulata)*, Mosquitofish (*Gambusia affinis*), Blackchin Tilapia (*Sarotherodon melanotheron)*, Convict Cichlid (*Amatitlania nigrofasciata)*, Smallmouth bass (*Micropterus dolomieu)*, Carp (*Cyprinus carpio),* Goldfish *(Carassius auratus),* Dojo *(Misgurnus anguillicaudatus),* White Cloud Mountain Minnow *(Tanichthys albonubes)*, Rainbow Trout (*Oncorhynchus mykiss*)

Introduced Crustaceans, Mollusks, and Amphibians: Tahitian prawn (*Macrobrachium lar*), Grass Shrimp (*Neocaridina denticulata sinensis*), Crayfish (*Procambarus clarkii*), Cane Toad (*Bufo marinus*), Bull Frog (*Rana catesbeiana*), Wrinkled Frog (*Rana rugosa*)

Insects: We captured pictures of damselfly and dragonfly adults and larvae for identification whenever we observed them during this project. We typically do not survey small or cryptic insect populations with this technique.

During the video classification, a start code was inserted when the camera was in position. Next, all individuals of all species were recorded, and then a stop code was inserted. For each sample, the habitat type was recorded. This process allowed underwater video samples to be linked with the appropriate GPS data for that location.

When density estimates for stream animals were needed, an estimate of the area observed was determined by recording average depth and width of field captured in the sample area. These two measures were multiplied together to get sample site area. The total number of each species observed within each habitat type for the different areas surveyed was divided by the area of that habitat type to get the species density within each habitat type. See Figure 5 for examples of stream animals observed.

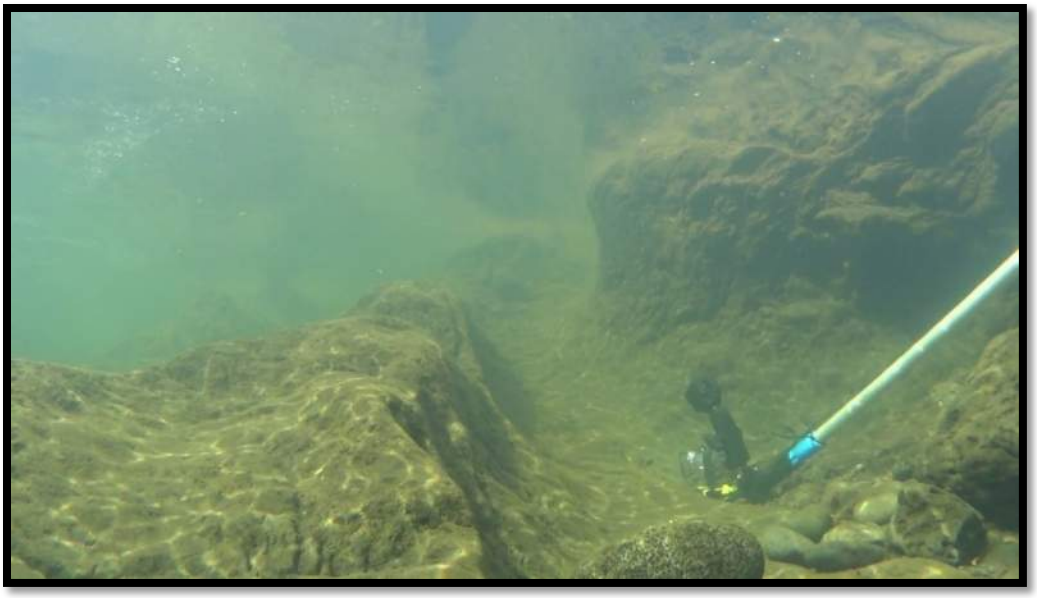


Figure 3: Underwater geo-referenced video camera with external video light used for the HDFS observations.

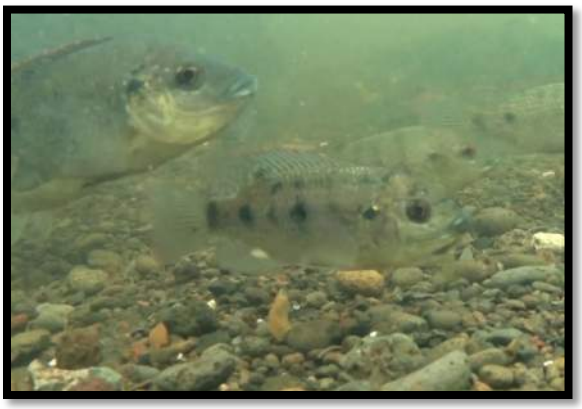
Figure 4: Example of HDFS surveys in North Fork of the Wailua River, Kauaʻi.

Native fish, *Awaous stamenius,* in a stream pool in Iʻao Stream, Maui.

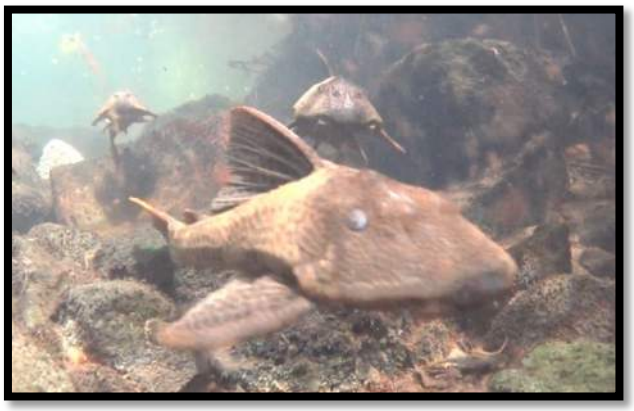
Native fish, *Sicyopterus stimpsoni*, on boulder substrate in Iʻao Stream, Maui.

Native species, *Kuhlia xenura*, in the lower reach of Iʻao Stream, Maui.

Introduced swordtails, *Xiphophorus hellerii*, in Iʻao Stream, Maui.



Introduced Blackchin tilapia, *Sarotherodon melanotheron*, over gravel substrate in Palolo Stream, Oʻahu.



Introduced armored catfish, *Hypostomus c.f. watawata in Waiawa Stream, Oʻahu.*

Figure 5: Examples of stream animals observed during HDFS projects on various Hawaiian Streams.

Discharge

To measure stream discharge, transects were set up across the stream perpendicular to the flow. For each cross section, measuring tape was placed over the stream at an area with a straight and uniform flow pattern, minimal obstructions, and free of vegetation. Finding uniform flow sites in Hawaiian streams can be difficult, so locations were chosen to best fit the ideal transect and rocks or other flow obstructions were moved to improve the transect uniformity. At each cross section, we recorded a site number, site name and operator ID prior to collecting the water velocity information.

Water velocity, water depth, and distance between points were measured at multiple points across a fixed transect using a handheld acoustic doppler velocimeter (Sontek Flowtracker2). Water velocity was measured at up to 3 points vertically (single point at 6/10th total depth, dual point at 2/10th and 8/10th total depth, or three point at 2/10th, 6/10th, and 8/10th total depth) based on water column depth and flow complexity. Stream discharge (cubic feet per second or cfs) was calculated to be the sum of discharge within each measured subsection (Figure 6).

The sample averaging time for a given point measurement was between 20 and 40 seconds and was dependent on point location flow characteristics. Shorter averaging times were appropriate for smooth flow locations and longer averaging times were used in turbulent flow conditions to better capture the average flow rate at the sample point (Sontek, 2016). The quality control settings on the FlowTracker 2 were set to highlight samples where Signal-to-Noise Ratio (SNR), Standard Error within the measurement, and/or spike thresholds were exceeded. Given the turbulent flow observed at most sites typical of the high gradient, boulder-filled Hawaiian streams, numerous quality control warnings were reported to the surveyor while conducting the flow measurements. Most of these warnings were addressed by extending measurement time, resampling the location, or including additional nearby measurements as conditions and time allowed.

In addition to performing quality control checks on individual water velocity measurements, quality control settings for locations across the transect were set in the FlowTracker 2 collection profile. The mid-section discharge equation was used with the Interpolated Variance Estimator (IVE) and a rated discharge reference (Sontek, 2106). The station warning settings of 10% for discharge, 50% for depth change, and 100% spacing change resulted in additional sample points being added within the transect to better account for areas with high flow variability.

To help better understand the baseline hydrological conditions within the upper Wailua River system, we completed a seepage run on the upper North Fork River (North Fork basin) and Waikoko Streams (South Fork basin). A seepage run is a way to determine the extent of groundwater / surface-water interaction within a river system. The seepage run is essentially a snapshot in time of the quantity of water within the tributaries and main stem of the river system. At each site within the river system, discharge was measured during stable flow conditions. The assumption for a seepage run is that discharge at the most downstream point is equal to the sum

of water flowing in from upstream locations. If discharge at the downstream point is less than the sum of upstream locations then it is likely water is flowing from the stream into the groundwater and, conversely, if discharge is greater at the downstream point than the sum of upstream locations, then water is likely upwelling from the ground into the stream. In addition to a direct measurement of discharge at up and downstream locations, we also developed a relationship between the discharge measured and upstream watershed characteristics. We used upstream area and average annual rainfall to help better predict discharge inputs from unmeasured locations.

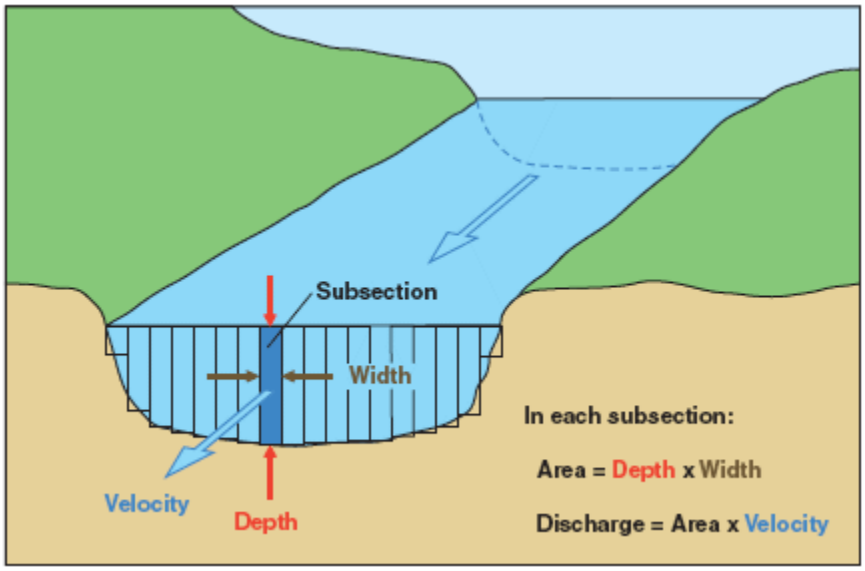


Figure 6: An example of an idealized stream discharge transect with subsection measurements. (Image from Streamflow Method. EarthSoft, Inc. 2017 http://help.earthsoft.com/6.6/edge/index.htm?streamflow-method.htm)

Water Quality

Water quality variables (water temperature °C), dissolved oxygen (% Saturation), pH, turbidity, and specific conductivity (µS/cm) were also measured at sampling locations. Like discharge, water quality measures are a "point-in-time" measurement that vary with weather conditions but still provide an indication of the water suitability for stream animals under the observed conditions. We used a Eureka Manta 35 water quality meter and/or a Horiba U-50 water quality meter to gather the water quality data. The sensors were calibrated according to the manufacturer's recommendations prior to the survey samples (Figure 7).

Figure 7: An example of water quality sampling. Here, Dr. Parham is collecting water quality measurements for Iliʻiliʻula Stream, Kauaʻi

MODELING

HSHEP Model

The HSHEP model is an outgrowth of a history of collaboration among biologists at DAR and researchers at various universities, agencies, museums, and private companies. The collaborative effort focused on understanding the different aspects of the ecology and management of amphidromous stream animals (Fitzsimons and Nishimoto 2007). The HSHEP model is an attempt to quantify how various man-made changes affect native Hawaiian stream animals. The HSHEP model is intended to capture the major aspects of native stream animal ecology, the typical geomorphology of Hawaiian streams, and common modifications to the environment within a single model. Additional factors outside of habitat can be modeled with the HSHEP approach but need additional modeling steps that are currently best addressed on a case-by-case basis. The HSHEP model provides water managers the ability to assess change to native species

habitat with respect to flow modifications, watershed development, or in-channel structures and is important in understanding the positive or negative implications of various actions.

The HSHEP model follows the overall Habitat Evaluation Procedure (HEP) model concepts developed by the U.S. Fish and Wildlife Service (USFWS) to evaluate the quantity and quality of habitat available for a species of concern (USFWS 1980a, b, USFWS 1981). In general, a Habitat Evaluation Procedure (HEP) model has several characteristics:

1. It is a habitat-based assessment method.
2. It assumes that habitat quality and quantity are related to the number of animals using a habitat over the long term.
3. It uses measurable attributes of habitat quality and quantity to create relationships between habitat suitability and animal occurrence and density.
4. It converts suitability relationships into standardized Habitat Suitability Indices (HSI) that encompass the range of observed habitat conditions.
5. The HSI values range from 0 (unsuitable habitat) to 1 (most suitable habitat).
6. It multiplies the habitat quality (value from the HSI) with the habitat quantity (area) to determine overall Habitat Units (HU) within the area of concern.

As a result of the model design, HEP impact analyses are intended to allow the user to:

- provide defined suitability-based estimates of HU within a study area,
- provide impact assessments of the changes of HU within the study area under different management scenarios,
- provide objective comparable unit measures for multi-site comparisons,
- quantify changes in HU to be annualized and comparable with other cost/benefit analyses,
- create plots of the distribution of HU in map-based formats (GIS analyses) to address issues of habitat fragmentation or connectivity.

The HEP user manual describes HEP models this way: “HEP is a convenient means of documenting and displaying, in standard units, the predicted effects of proposed actions.” USFWS designed HEP to be a legally defensible, standardized format for impact assessment in natural resource settings (USFWS 1980 a). While HEP models have been developed and used for impact assessment nationally for hundreds of species of birds, mammals and fish, this is the first HEP model to assess changes in stream animal habitat in Hawaiʻi.

Traditional HEP procedures have been joined with multi-spatial modeling efforts for Hawaiian streams (Parham 2002, Kuamoʻo et al. 2007, Parham 2008). The multi-spatial models address issues of scale in understanding differences in habitat availability and species distributions. For example, the presence or density of amphidromous animals is influenced by the location of the

sample site within a stream. Similar habitats found near the ocean may have different species assemblages than habitats found further inland. Additionally, characteristics of different watersheds and their streams influence the observed species assemblages. Therefore, streams with terminal waterfalls have different species assemblages than streams without terminal waterfalls. By assessing suitability at multiple spatial scales, different aspects of amphidromous animal ecology can be more appropriately modeled (Figure 8, Figure 6). As a result of the combination of the HEP method with multi-scale analysis, management issues can be addressed on a site, stream segment, whole stream, or region level. The HSHEP model is intended to be useful to assess the impacts of stream channel modification, flow alteration, land use change, climate change, stream restoration, and barrier modifications.

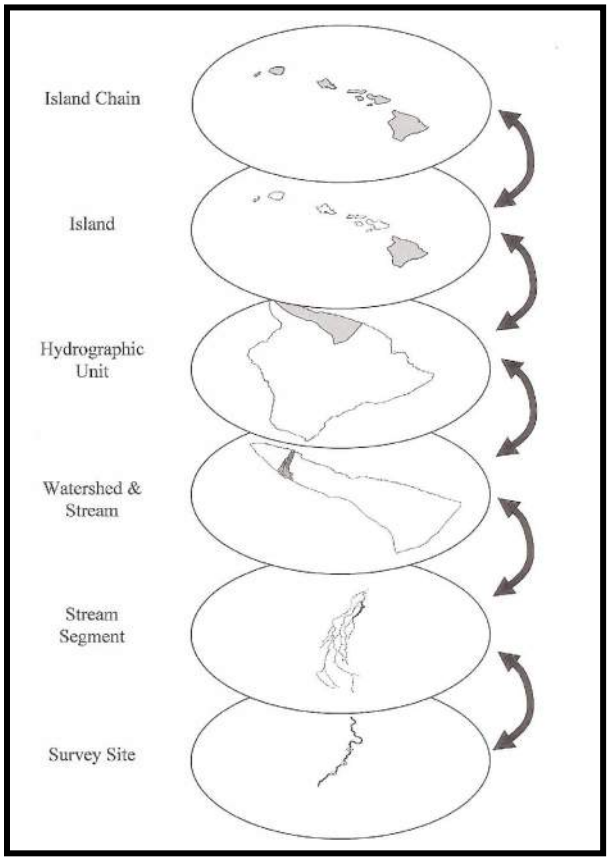


Figure 8: Spatially nested hierarchy of the DAR Aquatic Surveys Database and predictive levels within the HSHEP model. The latest description of the HSHEP model can be found in:

Parham, J.E. 2015. The Hawaiian Stream Habitat Evaluation Procedure (HSHEP) model: Intent, Design, and Methods for Project Impact Assessment to Native Amphidromous Stream Animal Habitat. Submitted to Civil and Public Works Branch, U.S. Army Corps of Engineers, Honolulu District, HI. 178 pages.

The HSHEP Model uses published information for species distributions at the watershed and reach scale and combines it with local data from the habitat and biotic surveys. Stream animals' distribution and habitat use are documented using information stored in the DLNR-DAR Aquatic Surveys Database (2009). This represents over 13,000 survey locations and over 90,000 species observations (Parham et al, 2002-2010). The database includes results from state surveys as well as those from federal, university, and private researchers. More than 370 different literature sources support the data contained within the DAR Aquatic Surveys Database. The HSHEP model leverages the data within the DAR Aquatic Surveys Database to develop quantitative measures of habitat use for native stream animals. For this project, the HSHEP model was created for the typical group of native freshwater fish and macroinvertebrates found in Hawaiian streams (Table 1).

Table 1: Highlighted Species habitat evaluated within Wailua River for this project.

Organism Type and Family	Scientific name	Hawaiian name
Freshwater fish (family Gobiidae)	*Awaous stamenius**	ʻOʻopu nākea
	*Lentipes concolor**	ʻOʻopu alamoʻo
	*Stenogobius hawaiiensis**	ʻOʻopu naniha
	*Sicyopterus stimpsoni**	ʻOʻopu nōpili
Freshwater fish (family Eleotridae)	*Eleotris sandwicensis**	ʻOʻopu akupa
Freshwater shrimp (Crustacean) (family Atyidae)	*Atyoida bisulcata**	ʻŌpae kalaʻ'ole
Freshwater prawn (Crustacean) (family Palaemonidae)	*Macrobrachium grandimanus**	ʻŌpae ʻoehaʻa
Freshwater snail (Mollusk) (family Neritidae)	*Neritina granosa**	Hīhīwai

*Identified as "Species of Greatest Conservation Need" in the Hawaiʻi Statewide Aquatic Wildlife Conservation Strategy (Meadows et al. 2005).

The selection of the highlighted set of amphidromous stream animals is appropriate in this case for several reasons.

- These species have been observed on Kauaʻi and statewide.
- All these species have a diadromous life history, meaning that they migrate from the freshwater stream to the ocean and back again (McDowall 2007). This potentially exposes the migrating animals to barriers in the stream pathway, entrainment into water diversion systems, and elimination of suitable habitat resulting from structures associated with the ditch system and its diversion.
- The DAR Aquatic Surveys Database has distribution and habitat use information for each of these species.

- The HSHEP model has habitat suitability indices developed for each of these species.
- This project was an update to the Upper and Lower Waiahi Hydropower HSHEP Model completed in 2014 (Parham 2014), and thus we used the same set of species in this new model version.

We estimated stream discharge for each basin by comparing basin-area rainfall to discharge values collected during a seepage run and assigned the appropriate values to each basin (dash-dot delineated areas in Figure 9). We assigned values of habitat units available for production of each species of conservation concern from data generated during on-the-ground field surveys, to each basin. The values used for each 'node' – locations of the natural barriers and artificial diversions impacting streamflow that contributed to the Wailua River System – were a vector of the amount of water passed, entrainment potential, passage barrier potential, and a general value for additional impacts for both upstream and downstream effects. These values were determined for each node during field surveys and from historical records about the installation and purpose of the diversions.

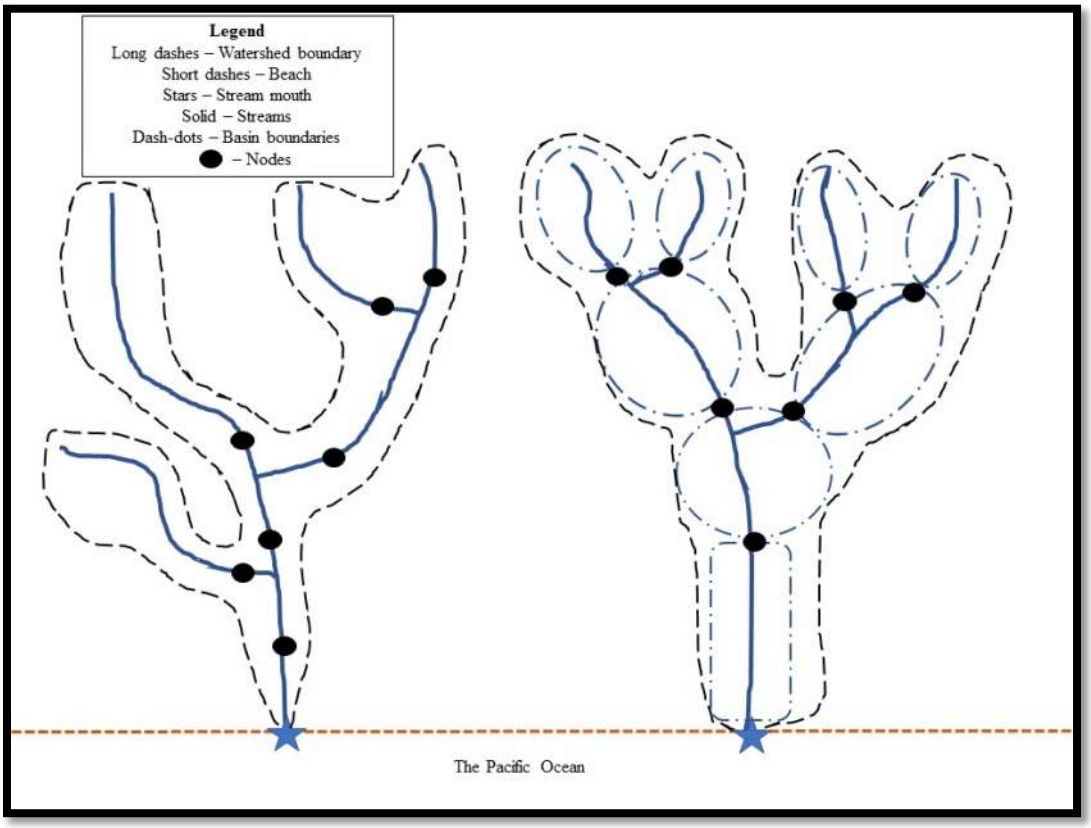


Figure 9: Conceptual schematic displaying the relationships among nodes, basins, and watersheds used in the HSHEP model.

We performed modeling of the water and habitat availability within the Wailua River System area using several assumptions. The calculations for water availability assumed that the amount of water available in any basin was a measure of the water in that basin augmented by the amount of water passed from the basin immediately upstream. For example, the amount of water present in basin II in Figure 11 is modeled as the amount of streamflow measured in that basin, plus the amount of stream flow from basin III minus the percentage of stream flow from basin III that is filtered by node 3. If 100 units of water are present in basins II and III, and node 3 diverts 50% of flow, then the modeled amount of water present in basin II is 150 units (100 units + (100 units* 50% diversion)). This model assumption accounts for the facts that water passes downstream and that Hawaiian streams are generally gaining streams, so that complete de-watering by an upstream diversion will not affect downstream basins beyond those immediately downstream. The model calculations to estimate habitat in each basin operated on the assumption that the production of a species in a basin was a function of the habitat in that basin, filtered by the upstream restrictions of any basins downstream and augmented by any habitat available for production from the upstream basins as filtered by the intervening node. As an example using Figure 11, the amount of habitat available for production of a species in basin II is the amount of habitat in that unit multiplied by the upstream filtering effects and habitat present in basin I and nodes 1 and 2, plus the habitat available in basin III as filtered by the downstream passage/entrainment effects of node 3. These assumptions allow us to model the production of species of conservation concern from any basin while accounting for potential upstream and/or downstream effects due to diversions or other barriers, up to and including functionally preventing production in a basin due to complete de-watering or barrier passage (i.e. an undercut waterfall). For example, if node 2 represented an undercut waterfall in Figure 10, and thus prevented upstream migration of any species, the remaining habitat available in the upstream basins of the watershed (basins II-VI) would be modeled as 0 for migratory species.

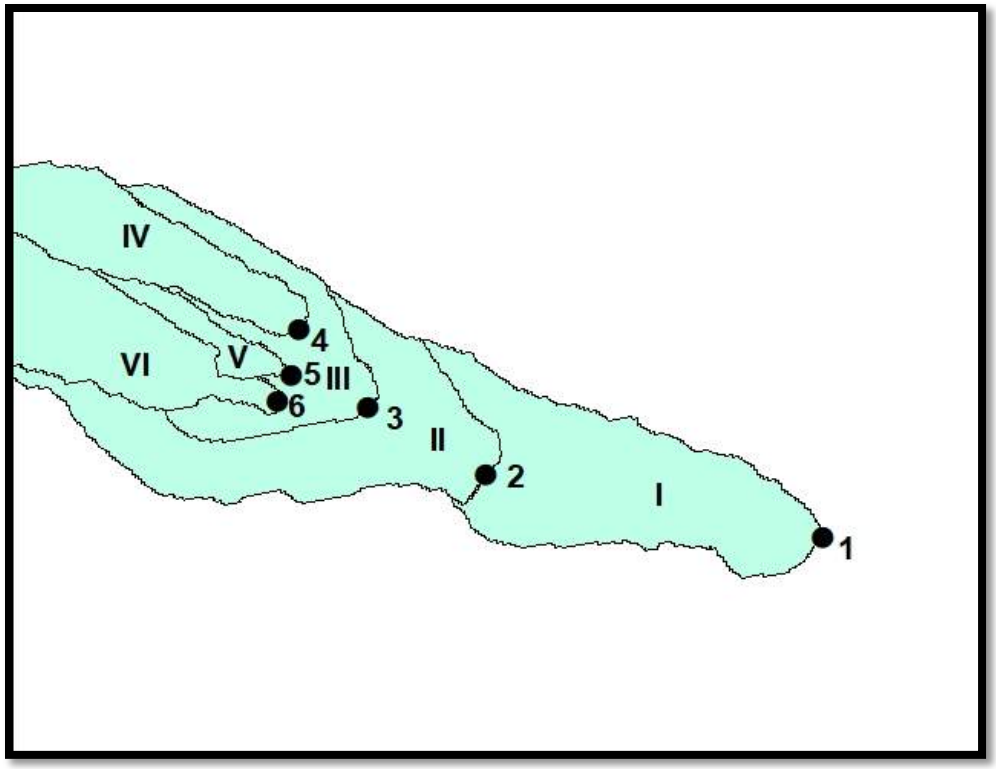


Figure 10: Schematic of a watershed showing the relationships among nodes (Arabic numerals 1-6) and basins (Roman numerals I-VI).

For the Wailua River System, we defined the upstream and downstream basins and their associated nodes for every basin within the study area. We next wrote two equations for every basin: one to calculate the habitat available in each basin and one to calculate the amount of water found in each basin, both of which incorporated relationships from adjoining basins. We used these equations to model the effects of differing diversion rates on the habitat, biomass production, and water output of the diversions.

We calculated the amount of available habitat in a basin for a specific species as:

$$Habitat_{E(i)} = (Habitat_{SP(i)} * Node_{DS(i)}) * (Habitat_{SP(i-1)} * Node_{US(i-1)}) * (Habitat_{SP(i-2)} * Node_{US(i-2)})\ldots + (Habitat_{SP(i+1)} * Node_{US(i)}) + (Habitat_{SP(i+2)} * Node_{DS(i+1)})\ldots + (Habitat_{SP(i-N)} * Node_{US(i-N)})$$

Where:

- i = the current basin
- i – 1 = the basin downstream of the current basin
- i +1 = the basin immediately upstream of the current basin
- $Habitat_{SP(i)}$ = the measured habitat for a species in the current basin

- $Habitat_{E(i)}$ = the total affected habitat of the current node, accounting for upstream and downstream influences
- $Node_{DS(i)}$ = the filtering value for the node at the downstream end of the current basin
- $Node_{US(i)}$ = the filtering value for the node at the upstream end of the current basin
- N = number of basins upstream or downstream of the current basin

In this model, the same node will be the downstream node for the basin i+1, and therefore its downstream entrainment, diversion, etc., values are applied, or the upstream node for basin i, and so the values for the upstream direction are used. To model the impacts of the node system on the water available in each node, and to account for water captured from the system under different management regimes, we also wrote equations for each basin. The equations to calculate the amount of water present in each basin (and its inverse, the amount of water captured from each basin) followed the form:

$$Water_{E(i)} = Water_i + (Water_{(i+1)} * Node_{US(i)}) + (Water_{(i+2)} * Node_{US(i)}) \ldots (Water_{(i+n)} * Node_{US(i)}).$$

Where:

- $Water_i$ = amount of water present in the current basin
- $Water_{E(i)}$ = amount of water effected by upstream node

In this application, the $Node_{US}$ value is an atomic vector modeling for the percent of water passed from the adjacent upstream basin to the current basin through the diversion separating them. In cases where multiple tributaries pass water to the current basin through a single node, the water passed from each tributary is accounted for.

To evaluate the results of the modeling process and to facilitate easy interpretation, tables which display the impacts of differing node management scenarios on water and species production grouped by the stated categorical variable were created. To generate the output, we chose a case to be used as a baseline scenario. We then calculated the percentage increase or decrease in habitat and water production under different management plans relative to the baseline.

RESULTS

Study Area

The study area included the complete Wailua River system. Within the Wailua River system, major zones followed the delineation provided in the HSHEP1 model for the 2014 Upper and Lower Waiahi HSHEP Report (Parham 2014) (Figure 11). The Hydropower project's area of

impact was defined as the North Fork of the Wailua River upstream of the tributary confluences near the Stable Storm Ditch area, the South Fork of the Wailua River upstream of the Hanamāʻulu Diversion and South Fork tributaries downstream to the first downstream tributary confluence (Figure 13). Since the native amphidromous stream species are migratory, all upstream stream segments are included in the impact area. This Hydropower Impact Area was selected for several reasons:

1. As an update to the 2014 Upper and Lower Waiahi HSHEP model, we used base data developed for that model where possible to remain consistent.
2. The creation of the extended Hydropower Impact Area with the HSHEP2 model in 2014 Upper and Lower Waiahi HSHEP report in response to reviewer comment resulted in same overall conclusions. This supported that conclusion that the model results were not overly sensitive to the specific delineation of the impact area.
3. Field surveys completed during this project documented stream flow and instream habitat recovery downstream of these locations in the North Fork of the Wailua River, in lower Waikoko Stream, and in the South Fork of the Wailua River below the Hanamāʻulu Diversion. Figure 12 shows images of these locations during our survey while upstream diversion was occurring.
4. Most importantly, advancements to the HSHEP modeling techniques between 2014 and 2019 improved the accounting and tracking of water as it was diverted or flowed downstream. In the 2019 HSHEP model any unit of water diverted at an upstream site is removed from all downstream segments. In contrast to the 2014 HSHEP model, where stream segments outside of the impact area were defined to have water and habitat "fully recovered", the 2019 HSHEP tracks the change in water quantity and resulting instream habitat all the way to the stream mouth. Thus in the 2019 HSHEP model, the impact area is only a descriptive area that summarizes impacts on areas near the diversions while the whole watershed zone summarizes total impacts.

Survey Sites: The following figures show basin and nodes coding as well as sample sites that were surveyed for this project (Figure 13, Figure 14). Although the Hydropower Impact Area was focused on the stream segments near the hydropower diversion, the whole Wailua watershed was included in the HSHEP model. Downstream of the hydropower impact area, there are large waterfalls on both the North and South Forks of the Wailua River that function as barriers to upstream migration by the native amphidromous stream animals. Additionally, there are other diversions downstream that may impact entrainment and instream habitat but were not the focus of the model. The overall model accounts for the local and network (up and downstream) impacts found in the Wailua River system.

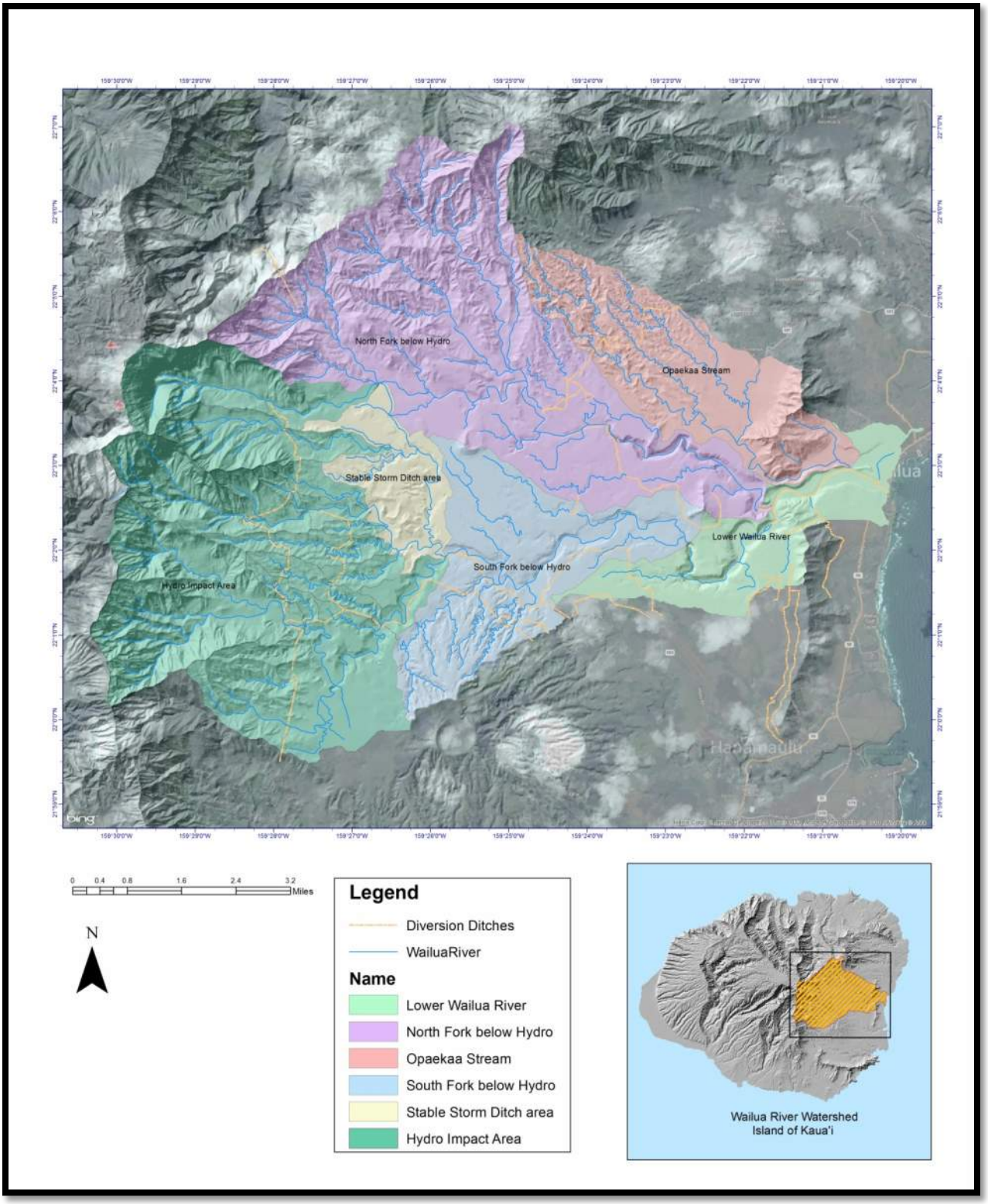


Figure 11: Major Zones associated with the HSHEP model for the Wailua River system. The Hydro Impact Area zone is further separated into smaller zones as shown in Figure 13.

Figure 12: Examples of stream flow and instream habitat recovery from field surveys at sites below the Hydropower Impact Areas. All images were collected during periods of upstream diversion.

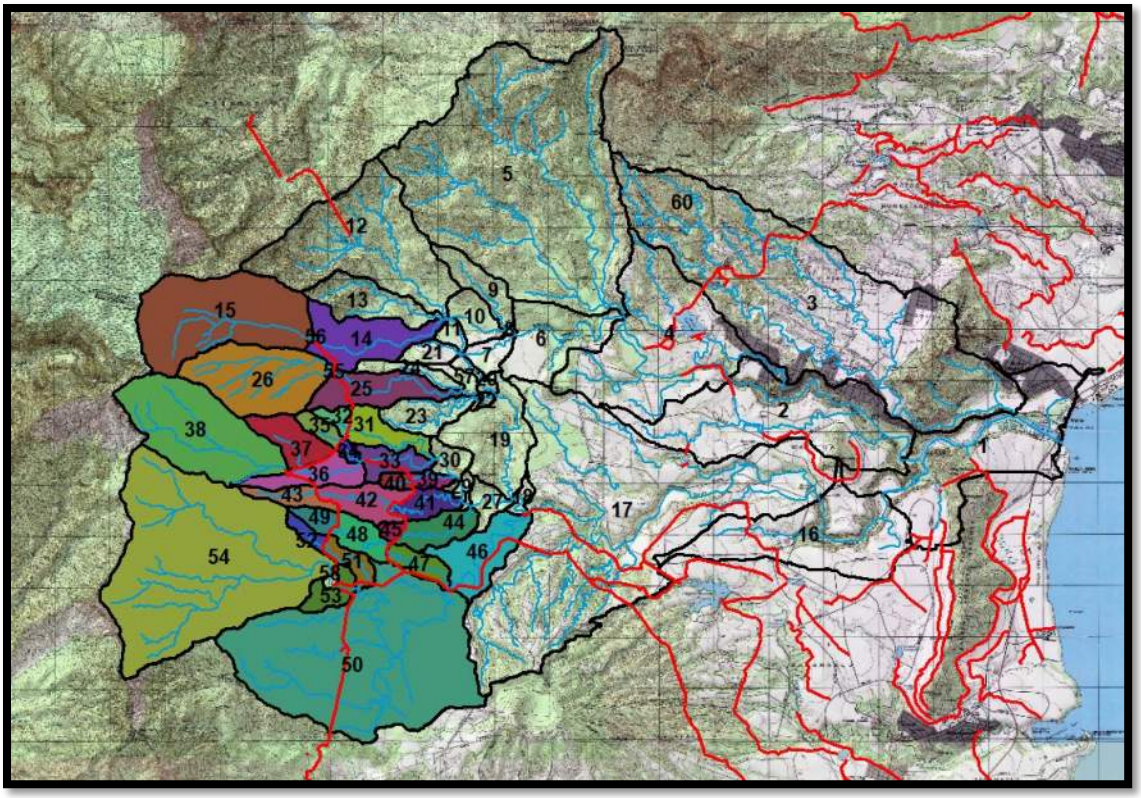


Figure 13: Map of Wailua River basins for the HSHEP model. The red line represents the ditch systems, the colored polygons were the hydropower impact area.

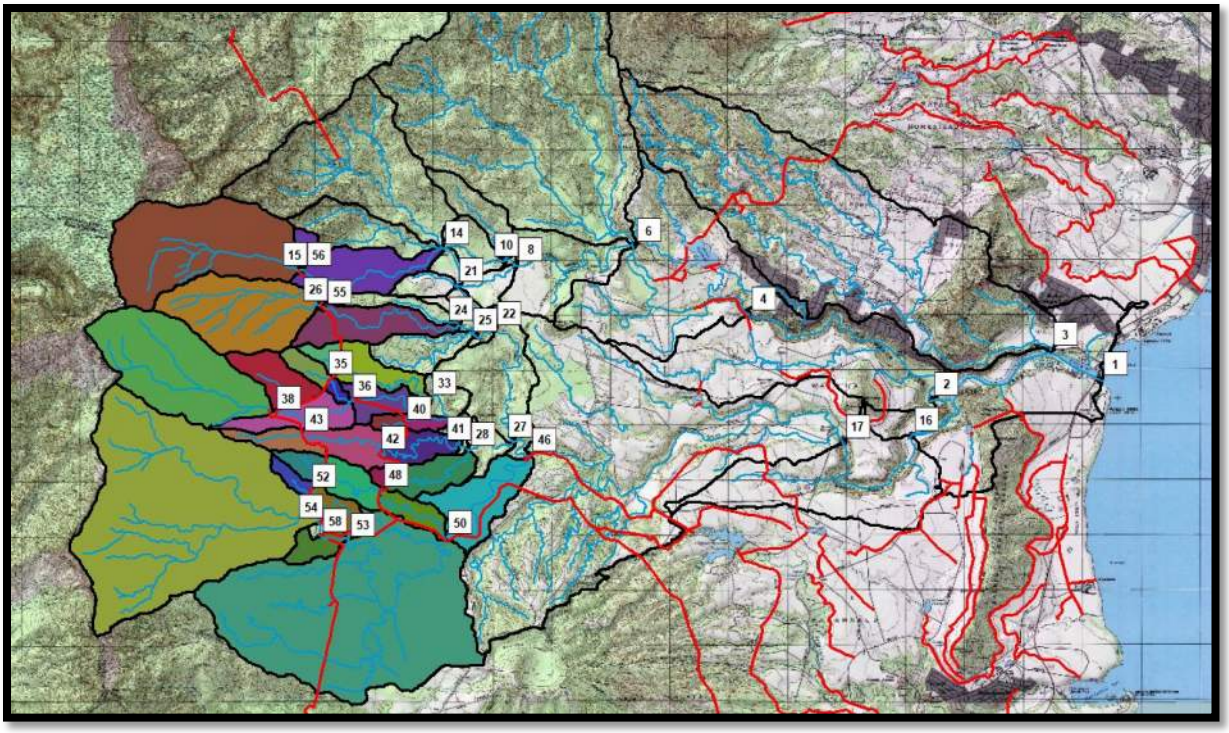


Figure 14: Map of Wailua River basins and nodes for the HSHEP model. The number represent the node codes used for the HSHEP model. The red line represents the ditch systems.

Flow Conditions during Surveys:

Prior Water Flow Conditions:

We surveyed the North and South Fork of the Wailua River sites associated with the Upper and Lower Waiahi Hydropower Diversions in February and June of 2018. We surveyed the North Fork of the Wailua River associated with the North Fork Diversion and Waikoko Stream on 2-11-2018, 2-12-2018, and 6-12-2018 to collect flow data for the seepage run. As a representation of the flow conditions prior to and during the general surveys and the seepage run surveys, we used the flow gage on the East Branch of North Fork Wailua River near Līhuʻe, Kauaʻi (USGS 16068000) as the representative gage.

During the February time period, the overall mean of daily mean discharge over the 104-year period of record was 51 cfs. The median daily discharge for February 11 was 28 cfs for the same period of record (yellow triangle on chart in Figure 15). For the survey dates, February 11-12, 2018, the average discharge was slowly falling during the period of survey from 38.3 to 34.7 cfs (Figure 16).

During the June time period, the overall mean of daily mean discharge over the 104-year period of record was 34 cfs. The median daily discharge for June 12 was 27 cfs for the same 104 years record (yellow triangle on chart in Figure 18). For the survey date June 12, 2018, the average discharge at the gage site was 34.8 cfs and was slowly falling during the survey period from 42 to 34 cfs (Figure 19).

Although the average daily discharge for the East Branch of North Fork Wailua River showed that discharge was similar between the February and June samples (38.3, 34.7 and 34.8 cfs respectively), the prior rainfall amounts were much higher during the February sample than during the June sample (Figure 17 and Figure 20) and the ground was more saturated with water during the February sample. The period between mid-January and mid-April was rainy and had numerous high flow spikes. A large peak flow of 4,020 cfs occurred on February 4, 2018 only a week prior to the surveys. The largest peak flow during the first half of 2018 occurred on April 15 with a discharge of 8,910 cfs recorded at the gage. After the April 15 flood event, stream discharge was less than 200 cfs at all times prior to the June 12, 2018 survey.

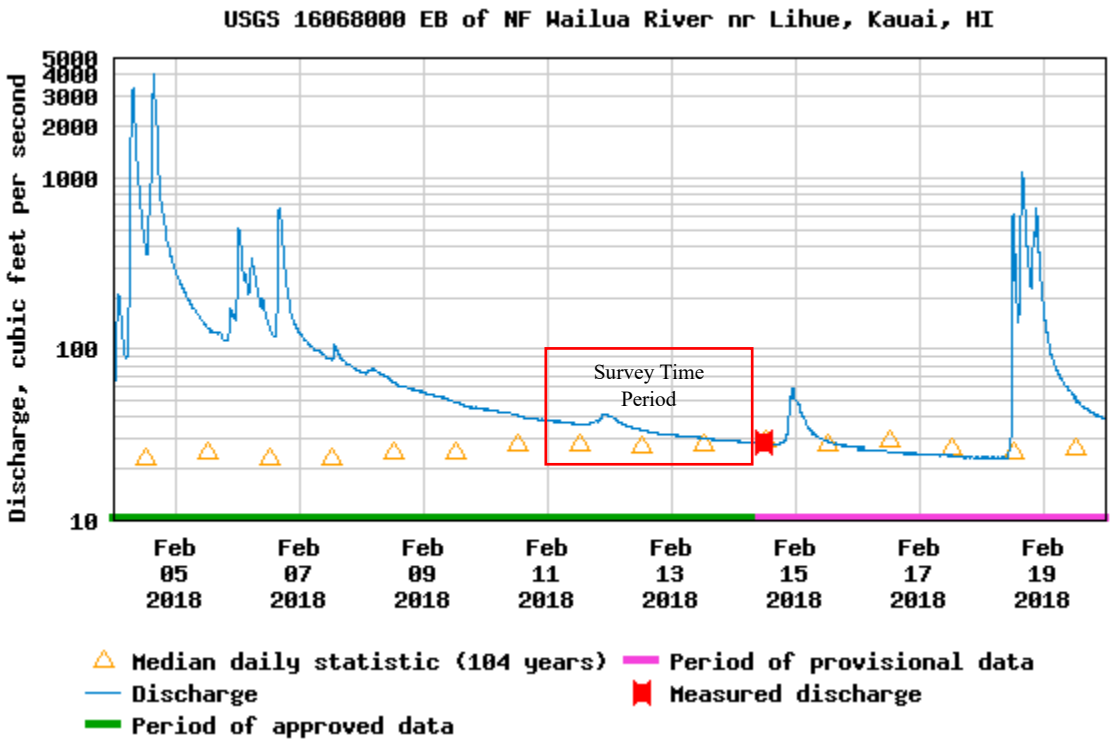


Figure 15: USGS gage data for February 3 - 21.

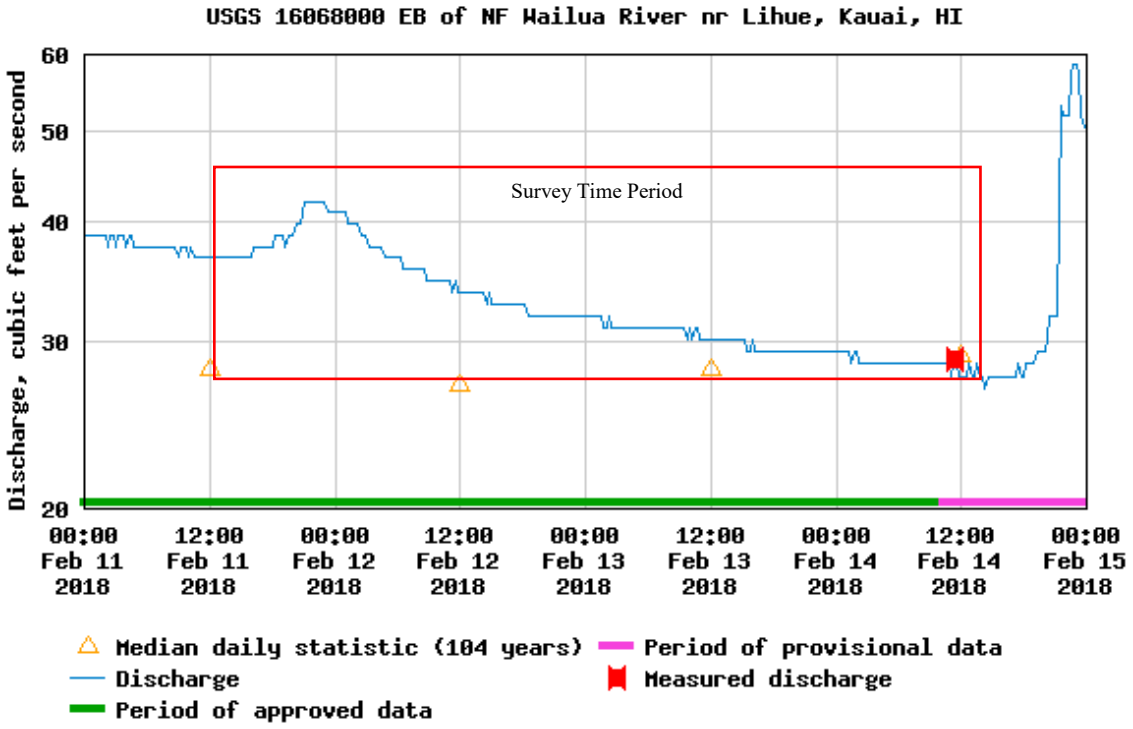


Figure 16: USGS gage data for February 11 - 15.

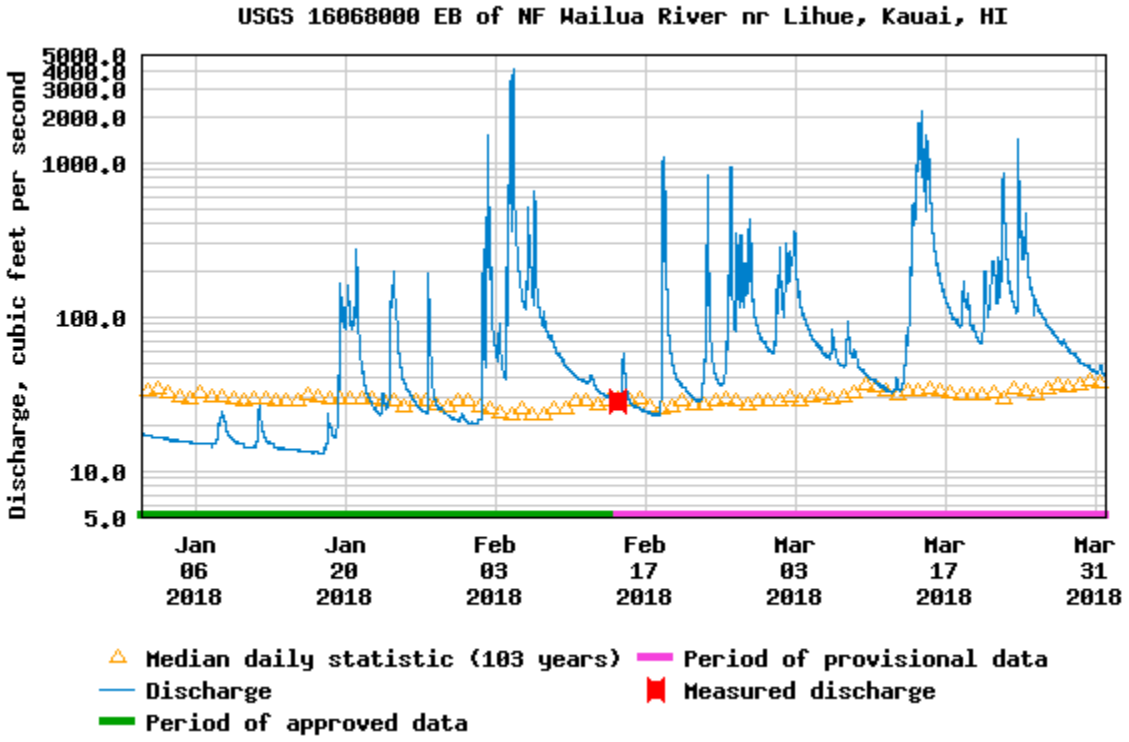


Figure 17: USGS gage data for January 1 – March 31, 2018.

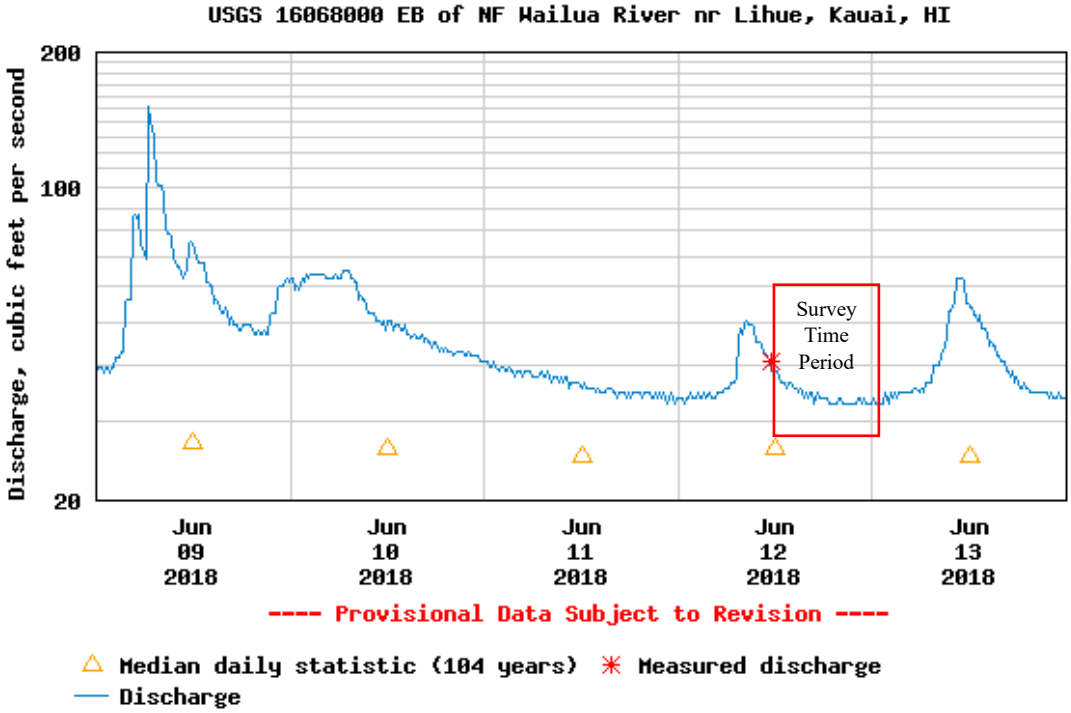


Figure 18: USGS gage data for June 9-13, 2018.

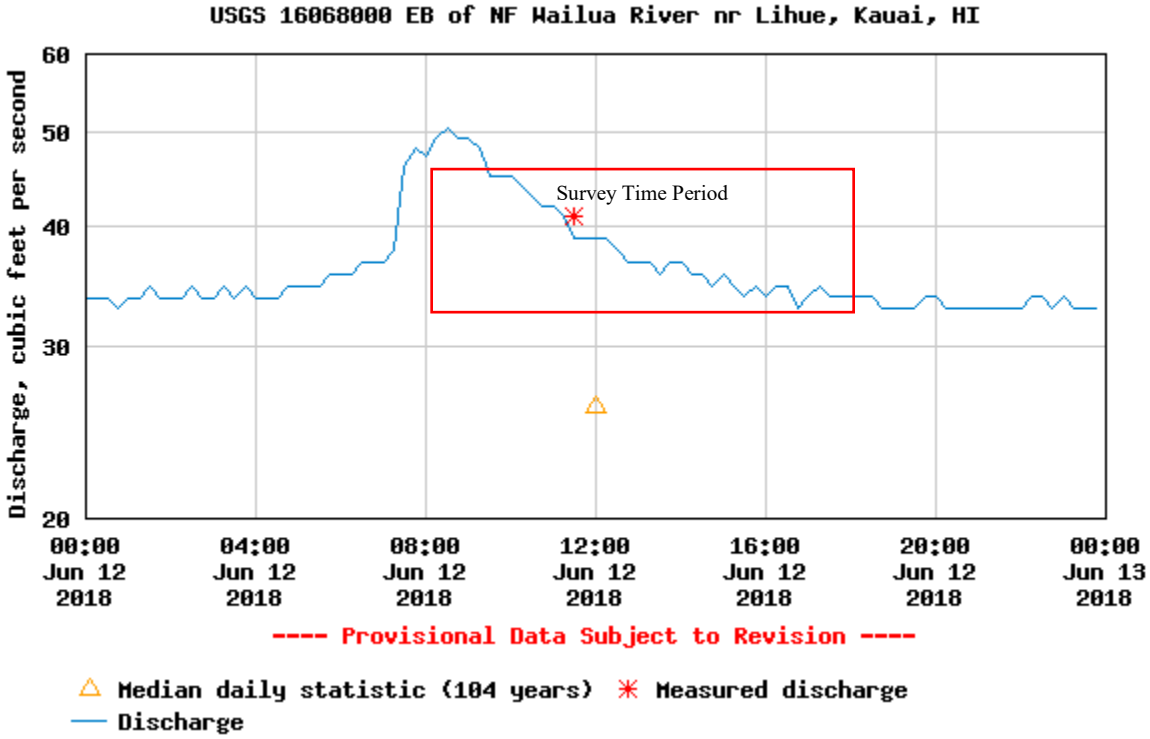


Figure 19: USGS gage data for June 12, 2018.

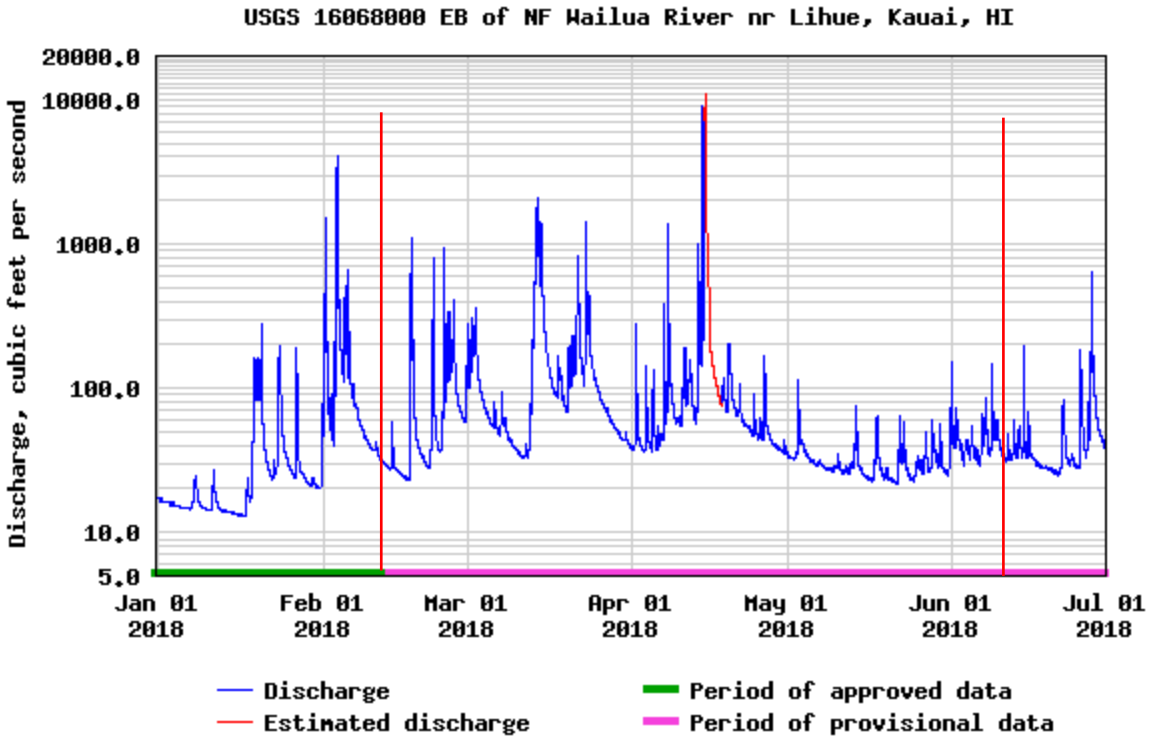


Figure 20: USGS gage data for Jan 1- July 1, 2018.

Results: *Habitat and Biota Surveys*

General Survey Information:

The surveys for the North and South Forks of the Wailua River were completed during the weeks of February 11-14, 2018 and June 12- 20, 2018. Eight general sampling areas were surveyed in the North Fork and nine areas in the South Fork (Figure 21 and Table 2. At most locations, we collected stream discharge, water quality, habitat condition and documented species present. The following description of the surveys will cover the North Fork sites first and then the South Fork sites.

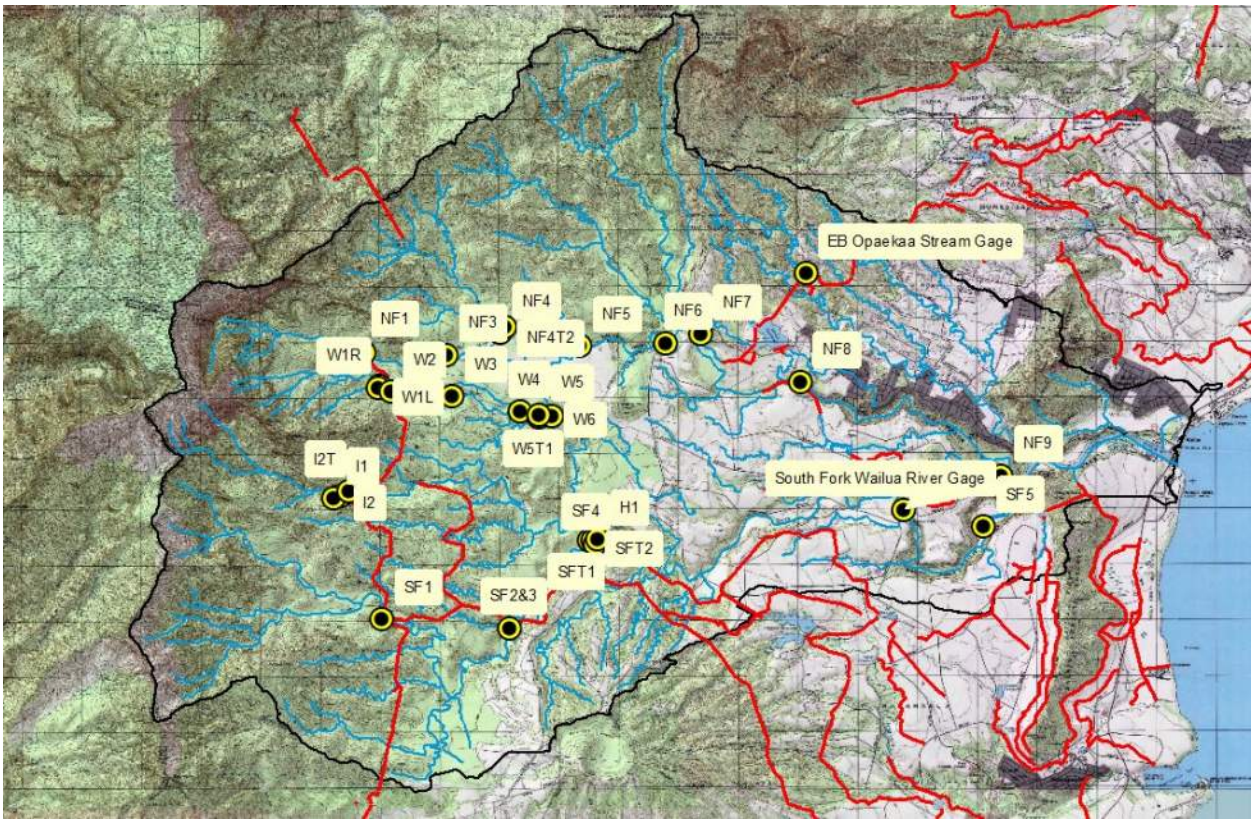


Figure 21: Map of sampling locations on the North and South Forks of the Wailua River.

Table 2: Sample Site name, description and survey date for North and South Fork of the Wailua River.

North Fork of Wailua River Sites				South Fork of Wailua River Sites		
Site	Description	Date		Site	Description	Date
NF1	NF Wailua River above North Fork Diversion	2/14/2018		W1L	Waikoko Stream above Diversion Left Fork	2/13/2018
NF2	NF Wailua River below North Fork Diversion	2/14/2018		W1R	Waikoko Stream above Diversion Right Fork	2/13/2018
NF3L	NF Wailua River at Hunt Path Left Braid	2/13/2018		W2	Waikoko Stream below Diversion	6/19/2018
NF3R	NF Wailua River at Hunt Path Right Braid	2/13/2018		W3	Waikoko Stream mid reach	2/14/2018
NF3D	NF Wailua River at Hunt Path Downstream Combined Flow	2/13/2018		W4	Waikoko Stream low reach	2/13/2018
NF4Up	NF Wailua River upstream of Stable Storm Ditch Confluence Area	2/11/2018		I1	Ili'ili'ula Stream above Diversion	6/18/2018
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	2/11/2018		I2	Ili'ili'ula Stream below Diversion	6/18/2018
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	2/11/2018		I2T	Tributary to Ili'ili'ula Stream	6/20/2018
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	2/11/2018		SF1	Waiahi Stream below Upper Hydro Return	6/18/2018
NF5	North Fork of Wailua River near Muddy Tributary	2/11/2018		SF2	Waiahi Stream above Lower Hydro Return	6/18/2018
NF6	North Fork of Wailua River below Road Crossing	2/11/2018		SF3	Waiahi Stream below Lower Hydro Return	6/18/2018
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	6/17/2018		SF4	South Fork of Wailua River at Hanamaulu Diversion	6/18/2018
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	6/17/2018		SF5	South Fork of Wailua River below Wailua Waterfall	6/20/2018
NF8	North Fork of Wailua River above Kaholalele Falls	6/17/2018				
NF9	North Fork of Wailua River below Kaholalele Falls	6/20/2018				

North Fork of the Wailua River – Habitat and Biota Results

We surveyed the North Fork of the Wailua River above the North Fork diversion down to the lower reach below Kaholalele Falls (Figure 22). The list of sites can be found in Table 2 and site attributes are summarized in the following tables: list of species observed (Table 3), distribution of habitat types (Table 4), distribution of water depth (

Table 5), distribution of substrate types (Table 6), and distribution of the wetted width of the stream channel (Table 7).

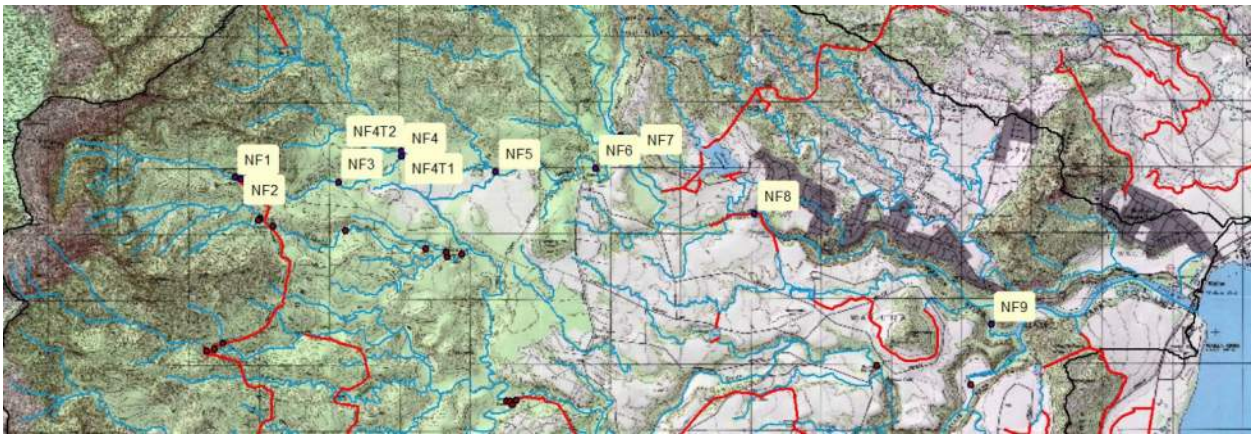


Figure 22: Map of the nine sampling areas on the North Fork of the Wailua River.

Table 3: Species observed during surveys on the North Fork of the Wailua River.

North Fork of the Wailua River																		
		Native Species										Introduced Species						
Site	Description	AB	LC	AS	SS	NG	ES	SH	MG	EN	Damselfly sp.	MD	ML	PR	XH	PC	BM	RC
NF1	North Fork of Wailua River above North Fork Diversion	C	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-
NFD1	In Diversion Ditch upstream of North Fork Ditch Gate	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	P
NF2	North Fork of Wailua River below North Fork Diversion	P	-	-	-	-	-	-	-	-	P	-	P	-	-	-	-	-
NF3L	Waiaeleale Stream at Hunt Path Left Braid	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-
NF3R	North Fork of Wailua River at Hunt Path Right Braid	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-
NF3D	North Fork of Wailua River at Hunt Path Downstream Combined Flow	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-
NF4Up	North Fork of Wailua River upstream of Stable Storm Ditch Confluence Area	-	-	-	-	-	-	-	-	-	-	-	C	P	-	-	-	-
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	-	-	-	-	-	-	-	-	-	-	P	C	P	-	-	-	-
NF5	North Fork of Wailua River near Muddy Tributary	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-
NF6	North Fork of Wailua River below Road Crossing	-	-	-	-	-	-	-	-	-	P	P	P	P	-	-	-	-
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-
NF8	North Fork of Wailua River above Kaholalele Falls	-	-	-	-	-	-	-	-	-	-	C	C	-	-	-	-	-
NF9	North Fork of Wailua River below Kaholalele Falls	-	-	C	-	-	P	C	P	-	-	P	P	P	P	-	P	-

C = Common, P = Present, - = not observed.

Native Species: AB = ʻŌpae kalaʻole (*Atyoida bisulcata*), LC = ʻOʻopu alamoʻo (*Lentipes concolor*) AS = ʻOʻopu nakea (*Awaous stamenius*), SS = ʻOʻopu nōpili (*Sicyotperus stimpsoni*), NG = Hihiwai *(Neritina granosa*), ES = ʻOʻopu akupa (*Eleotris sandvicensis*), SH = ʻOʻopu naniha (*Stenogobius Hawaiiensis*), MG = ʻŌpae oehaʻa (*Macrobrachium grandimanus*), EN = Newcomb's snail (*Erinna newcombi*).

Introduced Species: MD = Smallmouth bass (*Micropterus dolomieu)*, ML = Tahitian prawn (*Macrobrachium lar*), PR = Guppy (*Poecilia reticulata)*, XH = Green Swordtail (*Xiphophorus hellerii)*, PC = Crayfish (*Procambarus clarkii*), BM = Cane Toad (*Bufo marinus*), RC = Bull Frog (*Rana catesbeiana*).

Table 4: Habitat Type percentages for survey sites on the North Fork of the Wailua River.

North Fork of the Wailua River									
		Habitat Type %							
Site	Description	Pool	Run	Riffle	Cascade	Falls	Side Pool	Dry	Total
NF1	North Fork of Wailua River above North Fork Diversion	25%	25%	33%	17%	0%	0%	0%	100%
NF2	North Fork of Wailua River below North Fork Diversion	50%	28%	17%	6%	0%	0%	0%	100%
NF3L	North Fork of Wailua River at Hunt Path Left Braid	11%	56%	33%	0%	0%	0%	0%	100%
NF3R	North Fork of Wailua River at Hunt Path Right Braid	32%	42%	26%	0%	0%	0%	0%	100%
NF3D	North Fork of Wailua River at Hunt Path Downstream Combined Flow	17%	33%	50%	0%	0%	0%	0%	100%
NF4Up	North Fork of Wailua River upstream of Stable Storm Ditch Confluence Area	29%	47%	24%	0%	0%	0%	0%	100%
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	14%	71%	14%	0%	0%	0%	0%	100%
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	0%	63%	38%	0%	0%	0%	0%	100%
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	25%	44%	25%	6%	0%	0%	0%	100%
NF5	North Fork of Wailua River near Muddy Tributary	42%	33%	25%	0%	0%	0%	0%	100%
NF6	North Fork of Wailua River below Road Crossing	32%	32%	37%	0%	0%	0%	0%	100%
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	80%	20%	0%	0%	0%	0%	0%	100%
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	33%	53%	13%	0%	0%	0%	0%	100%
NF8	North Fork of Wailua River above Kaholalele Falls	29%	24%	33%	14%	0%	0%	0%	100%
NF9	North Fork of Wailua River below Kaholalele Falls	42%	33%	25%	0%	0%	0%	0%	100%

Table 5: Water Depth classes for survey sites on the North Fork of the Wailua River.

North Fork of the Wailua River										
		Water Depth in Thalweg (inches)								
Site	Description	Dry	< 1	1-3	3-6	6-12	12-24	24-36	> 36	total
NF1	NF of Wailua River above North Fork Diversion	0%	0%	0%	0%	40%	40%	20%	0%	100%
NF2	NF of Wailua River below North Fork Diversion	0%	0%	0%	24%	59%	18%	0%	0%	100%
NF3L	NF of Wailua River at Hunt Path Left Braid	0%	0%	0%	0%	56%	44%	0%	0%	100%
NF3R	NF of Wailua River at Hunt Path Right Braid	0%	0%	0%	27%	60%	13%	0%	0%	100%
NF3D	NF of Wailua River at Hunt Path Downstream Combined Flow	0%	0%	0%	14%	71%	14%	0%	0%	100%
NF4Up	NF of Wailua River upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	38%	56%	6%	0%	100%
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	25%	75%	0%	0%	100%
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	43%	57%	0%	0%	100%
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	38%	44%	13%	6%	100%
NF5	North Fork of Wailua River near Muddy Tributary	0%	0%	0%	0%	20%	47%	13%	20%	100%
NF6	North Fork of Wailua River below Road Crossing	0%	0%	0%	0%	22%	35%	13%	30%	100%
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	0%	0%	0%	0%	0%	9%	18%	73%	100%
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	0%	0%	0%	7%	7%	53%	13%	20%	100%
NF8	North Fork of Wailua River above Kaholalele Falls	0%	0%	0%	0%	5%	38%	14%	43%	100%
NF9	North Fork of Wailua River below Kaholalele Falls	0%	0%	0%	0%	22%	11%	22%	44%	100%

Table 6: Bottom Substrate percentages for survey sites on the North Fork of the Wailua River.

North Fork of the Wailua River															
		Bottom Substrate													
Site	Description	Fine/silt	Sand	Gravel	Small Mix	Cobble	Small Boulder	Med. Mix	Large Boulder	Bedrock	Large Mix	Full Mix	Man made	Unknown	Total
NF1	North Fork of Wailua River above North Fork Diversion	0%	0%	0%	0%	10%	0%	30%	0%	0%	50%	10%	0%	0%	100%
NF2	North Fork of Wailua River below North Fork Diversion	0%	0%	0%	0%	13%	0%	44%	6%	0%	31%	6%	0%	0%	100%
NF3L	North Fork of Wailua River at Hunt Path Left Braid	0%	0%	0%	6%	33%	6%	56%	0%	0%	0%	0%	0%	0%	100%
NF3R	North Fork of Wailua River at Hunt Path Right Braid	0%	0%	0%	25%	30%	0%	40%	0%	0%	0%	5%	0%	0%	100%
NF3D	North Fork of Wailua River at Hunt Path Downstream Combined Flow	0%	0%	0%	0%	17%	17%	67%	0%	0%	0%	0%	0%	0%	100%
NF4Up	North Fork of Wailua River upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	13%	6%	75%	0%	0%	6%	0%	0%	0%	100%
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	25%	38%	0%	38%	0%	0%	0%	0%	0%	0%	100%
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	44%	11%	44%	0%	0%	0%	0%	0%	0%	100%
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	0%	0%	0%	15%	15%	15%	30%	15%	0%	5%	5%	0%	0%	100%
NF5	North Fork of Wailua River near Muddy Tributary	0%	0%	0%	5%	15%	10%	30%	15%	0%	15%	10%	0%	0%	100%
NF6	North Fork of Wailua River below Road Crossing	0%	0%	0%	14%	36%	0%	32%	5%	0%	14%	0%	0%	0%	100%
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	0%	0%	0%	33%	0%	0%	20%	0%	0%	0%	0%	13%	33%	100%
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	0%	13%	0%	13%	31%	13%	31%	0%	0%	0%	0%	0%	0%	100%
NF8	North Fork of Wailua River above Kaholalele Falls	0%	0%	0%	0%	6%	0%	41%	24%	6%	24%	0%	0%	0%	100%
NF9	North Fork of Wailua River below Kaholalele Falls	11%	11%	11%	11%	33%	0%	22%	0%	0%	0%	0%	0%	0%	100%

Table 7: Wetted Width percentages for survey sites on the North Fork of the Wailua River.

North Fork of the Wailua River										
		Wetted Width								
Site	Description	Dry	1-10%	10-20%	20-40%	40-60%	60-80%	80-100%	Unknown	Total
NF1	North Fork of Wailua River above North Fork Diversion	0%	0%	0%	0%	0%	0%	100%	0%	100%
NF2	North Fork of Wailua River below North Fork Diversion	0%	0%	33%	56%	6%	6%	0%	0%	100%
NF3L	North Fork of Wailua River at Hunt Path Left Braid	0%	0%	0%	22%	17%	33%	28%	0%	100%
NF3R	North Fork of Wailua River at Hunt Path Right Braid	0%	0%	7%	36%	43%	14%	0%	0%	100%
NF3D	North Fork of Wailua River at Hunt Path Downstream Combined Flow	0%	0%	0%	0%	33%	67%	0%	0%	100%
NF4Up	North Fork of Wailua River upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	0%	63%	38%	0%	100%
NF4T1	Tributary 1 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	0%	0%	100%	0%	100%
NF4T2	Tributary 2 upstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	11%	11%	78%	0%	100%
NF4D	North Fork of Wailua River downstream of Stable Storm Ditch Confluence Area	0%	0%	0%	0%	25%	8%	67%	0%	100%
NF5	North Fork of Wailua River near Muddy Tributary	0%	0%	0%	0%	10%	40%	50%	0%	100%
NF6	North Fork of Wailua River below Road Crossing	0%	0%	0%	0%	7%	57%	36%	0%	100%
NF7Up	North Fork of Wailua River Upstream of Diversion to Wailua Reservoir	0%	0%	0%	0%	0%	0%	100%	0%	100%
NF7D	North Fork of Wailua River Downstream of Diversion to Wailua Reservoir	0%	0%	0%	0%	27%	45%	27%	0%	100%
NF8	North Fork of Wailua River above Kaholalele Falls	0%	0%	0%	0%	0%	19%	81%	0%	100%
NF9	North Fork of Wailua River below Kaholalele Falls	0%	0%	0%	0%	0%	33%	67%	0%	100%

North Fork Diversion Sampling Area (NF1, NFD1 & NF2)

Surveys of habitat and biota in upper sampling areas of the North Fork of the Wailua River were completed on 2-14-2018 (Figure 23). The surveys covered 236 m above (NF1) and 278 m below (NF2) the North Fork diversion. The stream discharge was 20.24 cfs above the diversion, 0.49 cfs below the diversion and with 19.75 cfs flowing into the Iliʻiliʻula – North Wailua Ditch. Water temperature was 19.9 °C at the diversion (other water quality parameters were not measured at these locations due to failure of the water quality sensor).

Above the diversion, the North Fork of the Wailua River flowed through a boulder and cobble-filled channel dropping from plunge pool to plunge pool through a series of cascades and riffles (Figure 24, Figure 25 and Figure 26). The diversion created a small pool with a mix of substrates present. Physical habitat conditions (stream slope and substrate) downstream of the diversion were similar to upstream conditions with the exception of the lack of water in the stream channel (Figure 27 and Figure 28). Water depth and wetted width consistently were lower when comparing conditions observed above to below the diversion (

Table 5 and

Table 7). The substrate was still unconsolidated boulders, cobble and gravel with a relatively steep gradient (Table 6). Small, shallow pools made up most of the habitat as only about 5% of the streamwater flowed past the diversion (Table 4).

During the biotic surveys, ʻōpae kalaʻole (*Atyoida bisulcata*) were documented above and below the diversion (Figure 29 and Table 3). ʻŌpae kalaʻole were in much higher densities above the diversion and were only observed in low numbers in a few pools immediately below the diversion. The presence of the ʻōpae kalaʻole indicates they were able to migrate up the North Fork of the Wailua River during high flows or through the Iliʻiliʻula – North Wailua Ditch from the South Fork. No native gobies or snails were documented during our survey. Additionally, we observed Tahitian prawns (*Macrobrachium lar*), Bullfrog tadpoles (*Rana catesbeiana*), and guppies (*Poecilia reticulata)* in the diversion pool and in pools immediately below the diversion. We observed guppies*,* Green Swordtails (*Xiphophorus hellerii*), and Bullfrog adults and tadpoles in the diversion ditch upstream of the North Fork ditch gates. We also observed a native damselfly, likely *Megalagrion vagabundum*, the Scarlet Kauaʻi Damselfly, near the diversion (Figure 30). We searched the main channel and several seeps that flowed into North Fork of the Wailua above and below the diversion, but we observed no Newcomb's snails (*Erinna newcombi*). Overall, conditions upstream of the North Fork Diversion appeared excellent for native stream animals.

During this survey there were little to no barriers present due to water flowing over the damaged diversion dam. There is a small overhanging concrete lip on the downstream edge of the diversion apron that could limit upstream passage for migratory stream animals and should be repaired (Figure 28), but during our survey some water flowed onto downstream boulders allowing a wetted pathway for passage. However, lower flows may fail to go over the dam and

all water would be diverted. The dry streambed caused by no downstream flow over the diversion could limit upstream passage for migratory stream animals. The downstream drifting larval ʻōpae kalaʻole would have issues with entrainment due the large amount of water being diverted and a small portion flowing downstream. Past vandalism to the diversion created a small low area on the dam which allows some water to flow past. We did observe several small seeps flowing into North Fork of the Wailua below the diversion and water appeared to gain in quantity toward the lower end of the downstream survey area.

Figure 23: North Fork Diversion sampling areas (NF1 and NF2) on February 11-14, 2018. The white line is the 4WD road to the North Fork Diversion site.

Figure 24: Looking upstream from the North Fork Diversion on NF Wailua River. The water flowing to the ditch is on the left and the water flowing downstream is on the right side of the image.

Figure 25: Looking upstream at the midpoint of the habitat survey in site NF1 above the North Fork Diversion on NF Wailua River.

Figure 26: Looking upstream at the upper end of the habitat survey in site NF1 above the North Fork Diversion on the NF Wailua River.

Figure 27: Looking upstream at the lower portion of the habitat survey in site NF2 below the North Fork Diversion on NF Wailua River.

Figure 28: Looking upstream at the North Fork Diversion on NF Wailua River in site NF2. The circled overhang could be a passage barrier at low flows if all of the flow goes over the overhanging lip. During our surveys, some of the flow was through the boulders to the left of the circle and provided a wetted pathway past this potential barrier.

Figure 29: ʻŌpae kalaʻole (*Atyoida bisulcata*) on boulders upstream of the North Fork diversion.

Figure 30: Native damselfly (likely Megalagrion vagabundum, Scarlet Kaua'i Damselfly) observed during the North Fork diversion sampling.

Hunt Path Sampling Area (NF3)

Habitat and biota were surveyed in the NF Wailua River around the Hunt Path sampling area (NF3) on 2-13-2018. The Hunt Path area was located approximately halfway between the North Fork Diversion and the Stable Storm Ditch areas on the NF Wailua River (Figure 31). This was the only access point we found to the NF Wailua River in between the North Fork and Stable Storm sampling areas. The Hunt Path sampling area is a braided section of river with apparent gaining and losing sections and the stream channel was choked with hau trees on the downstream end and bamboo and hau on the upstream end preventing our passage. We surveyed approximately 800 m of stream channel among the stream braids. We measured stream discharge of 3.1 cfs in the channel below the braided section. No manmade barriers were present; however, surface flows were greatly reduced in some reaches due to subsurface flows. Due to a sensor failure, no water quality data was collected although the water looked good to the eye.

The area was braided with multiple channels splitting off and rejoining. There appeared to be two main braids with other smaller braids (Figure 32, Figure 33, Figure 34). The habitat within this area showed obvious impacts from past flood events (Figure 35). Streambanks were eroding and trees were falling into the stream. The stream was primarily a mix of small boulder and cobble with larger and smaller size substrate mixed in.

We completed 72 HDFS sample sites with 27 in the first braid, 36 in the second braid and 9 in the combined segment. Tahitian prawn (*Macrobrachium lar*) was the most common and widespread species observed during the Hunt Path HDFS. Tahitian prawn were found in both stream braids and were very numerous in the larger, nearly disconnected pools in sections with subsurface flow. Guppies (*Poecilia reticulata*) were the only fish species observed (Figure 37) and they were restricted to several of the larger pools. In the few locations where guppies were

observed, they occurred in groups of 5 to 30 individuals. We surveyed several seeps draining into the NF Wailua River; however, no Newcomb's snails were observed (Figure 36). Of note, we did not observe any smallmouth bass in this location and Tahitian prawn were more widely spread out and less associated with protective cover. This area lacked the large, deep pools common in the North Fork of the Wailua River downstream of the Stable Storm Ditch area and thus, may not have had enough suitable habitat for smallmouth bass to persist in this area.

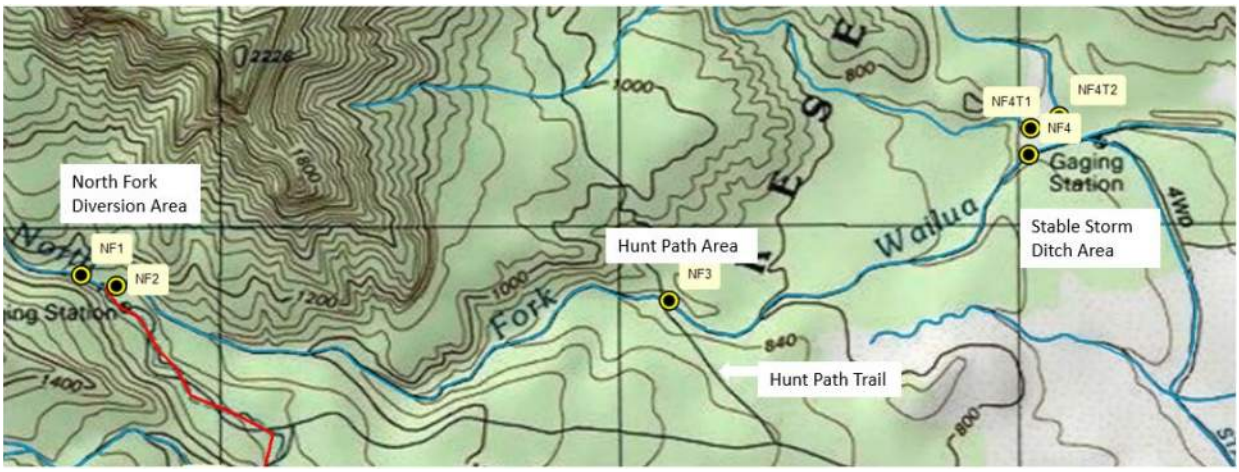


Figure 31: Map of the Hunt Path Area (NF3) on North Fork of the Wailua River.

Figure 32: The first braid of the NF Wailua River at Hunt path (NF3).

Figure 33: Second braid of the NF Wailua River at Hunt Path.

Figure 34: Confluence of stream braids near lower end of the Hunt Path survey area (NF3). Blue arrows show the location of the two incoming stream braids.

Figure 35: Evidence of past flood damage was clear in numerous locations. Here the left bank was highly eroded and collapsing into the stream.

Figure 36: Surveying for Newcomb's snails in a seep flowing into the stream in the Hunt Path area.

Figure 37: Guppies in pool in section NF3.

Stable Storm Ditch Sampling Area (NF4)

The Stable Storm Ditch sampling area was located above and below the confluence of the North Fork Wailua (NF4) with two additional tributary streams (NFT1 & NFT2) (Figure 38). The Stable Storm Ditch diversion has been washed away and is no longer active although some of the water control structures were seen on the streambank. No diversion for the Stable Storm Ditch was present and therefore no barriers to passage or entrainment issues existed at this site. On 2-11-2018, we measured 3.8 cfs of water flowing in the NF Wailua River, 4.3 cfs in the first tributary (NFT1) and 14.8 cfs in the second tributary (NFT2). A total of 22.8 cfs flowed downstream in the main channel of the North Fork below the confluence with the upper streams. Water quality measurements showed similar conditions in all of the stream channels with cool, clear, well-oxygenated water in each channel (Table 8).

Upstream of the confluence, all three streams were a mix of riffle, run and shallow pool habitats with mostly cobble and small boulder substrates before merging into a large pool below the confluence with the NF Wailua River (Figure 40, Figure 41, Figure 42). The effects of flooding can be seen on the streambanks with some erosion and downcutting observed (Figure 44). Downstream of the confluence area, the stream was showing of active erosion due to recent high flows.

We completed 63 HDFS sample sites in the combined downstream segment, 29 sites in the NF Wailua River (NF4), 19 sites in NFT1 tributary and 15 sites in NFT2 tributary. Tahitian prawn (*Macrobrachium lar*) (Figure 45) and guppies (*Poecilia reticulata)* were observed at this location. Smallmouth bass (*Micropterus dolomieu)* were observed not far downstream of this site.

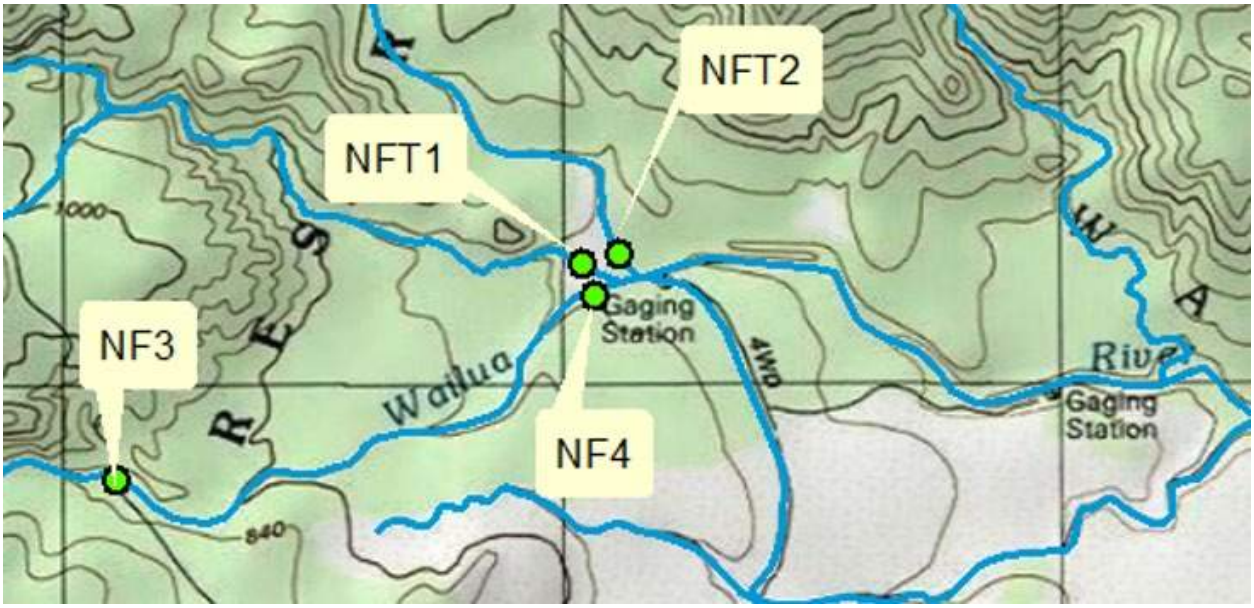


Figure 38: Map for the Stable Storm Area on February 11, 2018. NF Wailua River at Stable Storm (NF4), Tributary 1 at Stable Storm (NFT1, and Tributary 2 at Stable Storm (NFT2).

Table 8: Water quality measurements near Stable Storm Ditch on 2-11-2018.

Location	Date	Temp (°C)	DO (mg/l)	Turbidity (NTU)
NF4	2-11-2018	20.06	8.79	0.47
NFT1	2-11-2018	20.19	8.70	0.43
NFT2	2-11-2018	20.38	8.78	0.30

Figure 39: NF Wailua River (NF4) above tributary confluences.

Figure 40: The pool habitat formed after the 2 tributaries join the NF Wailua River on February 11, 2018. Notice that the tall trees to the right of center are no longer visible in the June photograph.

Figure 41: The pool habitat formed after the 2 tributaries join the NF Wailua River in June 2018.

Figure 42: Looking downstream at the pool habitat below the confluence.

Figure 43: NF Wailua River below the Stable Storm tributaries.

Figure 44: Example of bank erosion downstream of sampling area near the Stable Storm Ditch.

Figure 45: Macrobrachium lar observed in the Stable Storm Ditch survey area.

Muddy Water Sampling Area (NF5)

The NF5 sampling location was surveyed on February 11, 2018 and was located near a tributary which flowed into the main stem of the North Fork of the Wailua River (Figure 46, Figure 47). The tributary water was noticeably brown-colored, and the discolored water could be observed in the main stem for a significant distance downstream and therefore is referred to in this document as the "Muddy Water" area or tributary. The NF5 flow measurement location was upstream of the Muddy Water tributary on the main channel where we recorded a stream discharge of 23.1 cfs. Water quality samples were collected directly in the tributary flow as well as upstream before any influence of the turbid water. As expected, the turbidity measures were higher in the tributary water, while water temperature and dissolved oxygen were similar (Table 9).

A mix of riffles, runs, and pools was documented with pool habitat type being slightly more common than the other two types. More than 80% of the channel depth was greater than 12 in. deep consisting mostly of cobble and small boulder substrate and most of the width of the channel was wetted. In general, habitat appeared good in this stream segment with the exception of the muddy water flowing in from the small tributary stream.

The HDFS began downstream of the tributary and continued past the flow measurement cross-section covering approximately 200 m. A total of 66 HDFS survey sites were gathered in this area. We observed *Macrobrachium lar* in the sample sites (Figure 48) and observed smallmouth bass outside of the video survey sites. Unidentified red damselflies were observed flying around during the survey. In general, no animal species were common in this area with only a few individuals of any species being observed.

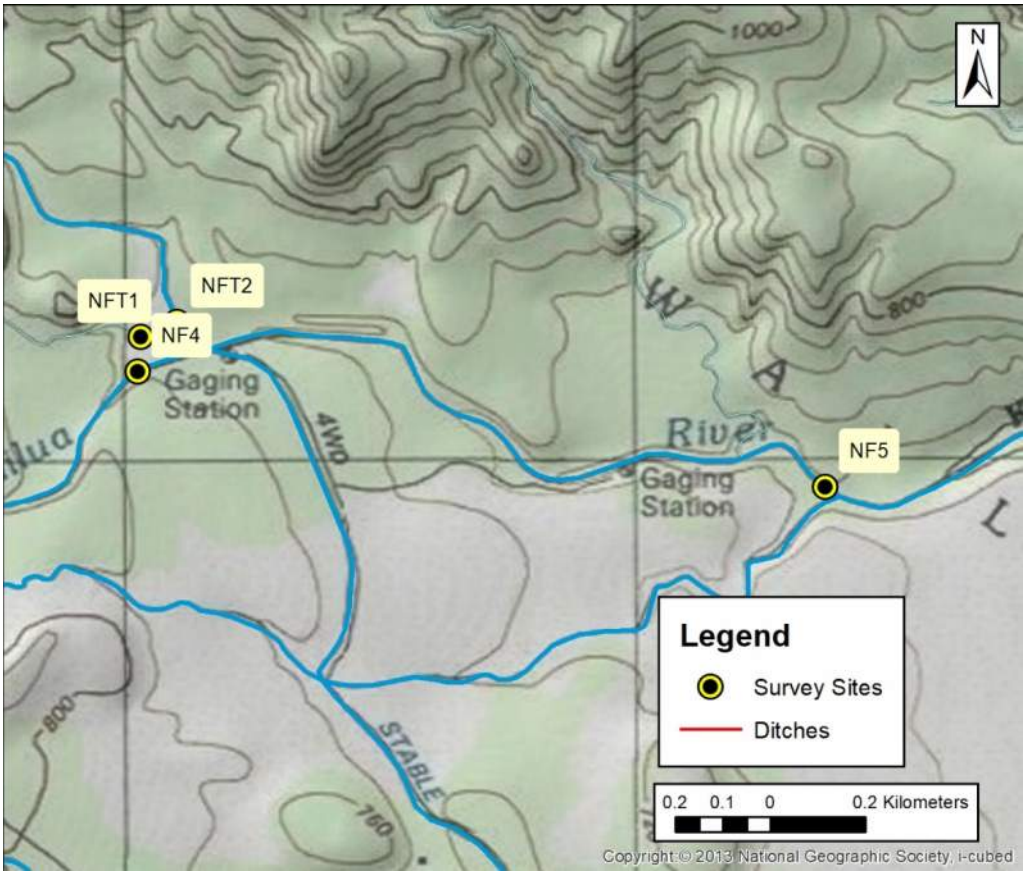


Figure 46: Map and flow measurement locations for the Muddy Water area on February 11, 2018. NF Wailua River at Muddy Water (NF5): 22.063524, -159.432332.

Table 9: Water quality measurements completed at the Muddy Water sampling area.

Location	Code	Date	Temp (°C)	DO (mg/l)	Turbidity (NTU)
North Fork of Wailua River above Muddy Tributary	NF5	2-11-2018	18.91	9.00	0.44
In Muddy Tributary	NF5T	2-11-2018	18.96	8.46	21.68

Figure 47: Confluence of Muddy Water tributary and the North Fork of the Wailua River.

Figure 48: Macrobrachium lar observed in the NF5 survey area.

Lower North Fork of the Wailua River Road Crossing Area (NF6)

The road crossing site sampling area (NF6) started well below the actual crossing and was surveyed on February 11, 2018 (Figure 49, Figure 50). Stream discharge was 31.1 cfs and the channel was 44 ft wide at the cross-section transect (Figure 51). Water quality readings were generally good at this location (Table 10). This was the last site on the North Fork of the Wailua River above the confluence with the East Branch.

This area had nearly an even mixture of riffles, runs and pools. The sampling area was relatively deep with 30% of the area greater than 36 inches deep. The substrate was generally a mix of small boulders and cobble with little fine substrates observed. The active channel here was wide with approximately 60% to 80% filled with water. Habitat appeared to be highly suitable for native stream species in the stream segment.

We conducted 46 HDFS sample sites covering 270 m. In the samples, we observed Tahitian prawn and guppies (Figure 52) in the shallower edges of the stream and smallmouth bass in the deeper sections. No species was particularly common in this stream segment. We observed adult damselflies flying around us during the survey. No native amphidromous stream animals were observed at the site.

Figure 49: Map Lower North Fork of the Wailua River Road Crossing Area (NF6), 22.064005, -159.418712.

Figure 50: Downstream of the NF6 Sample location.

Figure 51: NF6 flow measurement cross section.

Table 10: Water quality measurements completed at the Lower Wailua Crossing sampling area.

Location	Code	Date	Temp (°C)	DO (mg/l)	Turbidity (NTU)
North Fork of Wailua River near Lower Crossing	NF6	2-11-2018	18.22	9.11	5.71

Figure 52; Guppies observed in the NF6 sampling area.

NF Wailua River Ditch to Reservoir Sampling Area (NF7)

The diversion on North Fork of the Wailua River that supplied water to the Wailua Reservoir (NF7) was surveyed on 6-17-2018 (Figure 53). The diversion was open and not diverting any water when we surveyed this location. The diversion created a pool above it (Figure 54) and had a mix of riffle, run and pool habitat downstream. Most of the survey effort was done downstream of the diversion as the deep pool limited our survey ability. We gathered data on discharge, water quality, habitat and biota at this location. The river was 46.7 ft wide with a discharge of 79.0 cfs (Table 11) split between two downstream channels (Figure 55 and Figure 56). Water quality was generally good at this site (Table 12).

The diversion created a pool habitat upstream with a significant portion of manmade concrete substrate. Downstream of the diversion was a mix of riffle, run and pool habitat types and was on average much shallower than above the dam. The substrate above the dam appeared to be much finer than observed below which was mostly cobble and small boulder. We did observe some sand in one of the deeper pools downstream of the diversion dam. During our surveys there was plenty of water in this section and much of the active channel was wetted.

We observed smallmouth bass (1 adult ≈ 12 inches and 6 young of the year juveniles ≈ 2 inches) in the segment below the diversion (Figure 57). We also saw five large Tahitian prawn (*Macrobrachium lar*) (Figure 58). No other species were observed below the diversion. Water depth reduced the quality of the survey above the diversion, but we did observe three small smallmouth bass in the diversion pool. The presence of the young of the year juvenile smallmouth bass confirms that successful spawning of smallmouth bass is occurring in this area. Numerous introduced Asian clams (*Corbicula fluminea*) were observed in the sand and fine substrate areas in pools. No native fish species were observed in the survey although stream habitat appeared to be suitable for native species.

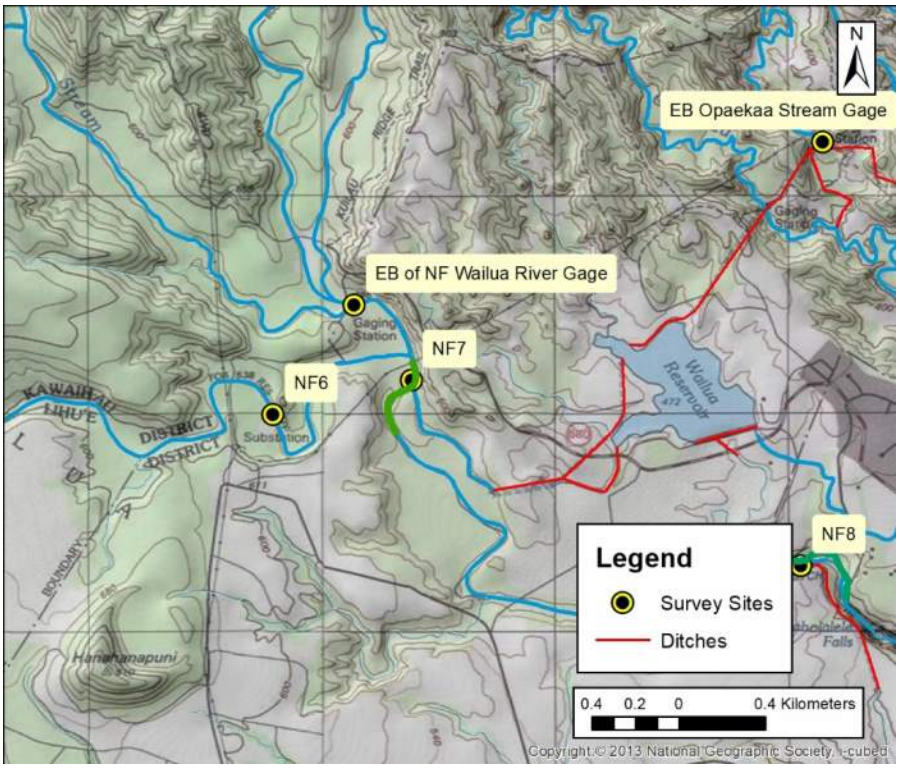


Figure 53: Map and flow measurement locations for the NF Wailua River at the diversion to Wailua Reservoir (NF7) on June 17, 2018.

Figure 54: The NF Wailua Diversion to Wailua Reservoir creating a pool habitat.

Table 11: All flow measurements completed at the NF Wailua Diversion to Wailua Reservoir sampling area.

Location	Site Code	Date	Total Width (ft)	Total Discharge (cfs)
Left fork of NF Wailua Diversion to Res	NF7L	6/17/2018	16	7.3
Right Fork of NF Wailua Diversion to Res	NF7R	6/17/2018	39	71.6
Total				79.0

Figure 55: Left channel flow measurement below diversion.

Figure 56: Right channel flow measurement below diversion.

Table 12: All water quality measurements completed at the NF Wailua Diversion to Wailua Reservoir sampling area.

Location	Code	Date	Temp (°C)	Sp. Conductivity (µS/cm)	DO (mg/l)	Turbidity (NTU)
North Fork of Wailua River near Wailua Reservoir Diversion	NF7	6/17/2018	21.9	89.9	8.82	1.69

Figure 57: Juvenile smallmouth bass downstream of the Wailua Reservoir Diversion.

Figure 58: Tahitian prawn downstream of the Wailua Reservoir Diversion.

Hindu Monastery (NF8)

We surveyed the North Fork of the Wailua River on 6-17-2018 by accessing the river through the Saiva Siddhanta Church (Hindu Monastery) property with permission from the owners. This site was immediately above the large Kaholalele Waterfall on the North Fork of the Wailua River (Figure 59). The survey area had a large plunge pool below an ≈ 30 ft waterfall in the middle of the survey segment. We gathered data on discharge, water quality, habitat and biota at this location. The river was 46.7 ft wide with a discharge of 80.5 cfs (Table 13 and Figure 60) and had relatively clear, well-oxygenated water (Table 14).

Waterfalls and dangerous terrain prevented a long overall survey; however, we were able to survey approximately 80 m below and 170 m above the 30 ft waterfall in the middle of the survey area. The habitat was a mix of runs and deep pools, with riffles and cascades near the waterfalls (Figure 61, Figure 62). Large boulders and cobble were common substrate. As a result of the numerous deep pools and swift cascades near large waterfalls, most of this section was surveyed by swimming through the area. In the deeper runs and pools both smallmouth bass and Tahitian prawns were common (Figure 64). No native amphidromous stream animals were observed although stream habitat appears excellent. We learned from discussions with monastery staff that largemouth bass, bluegill sunfish, channel catfish, and Koi been observed in this area as they are washed down from the upstream reservoir (Figure 63).

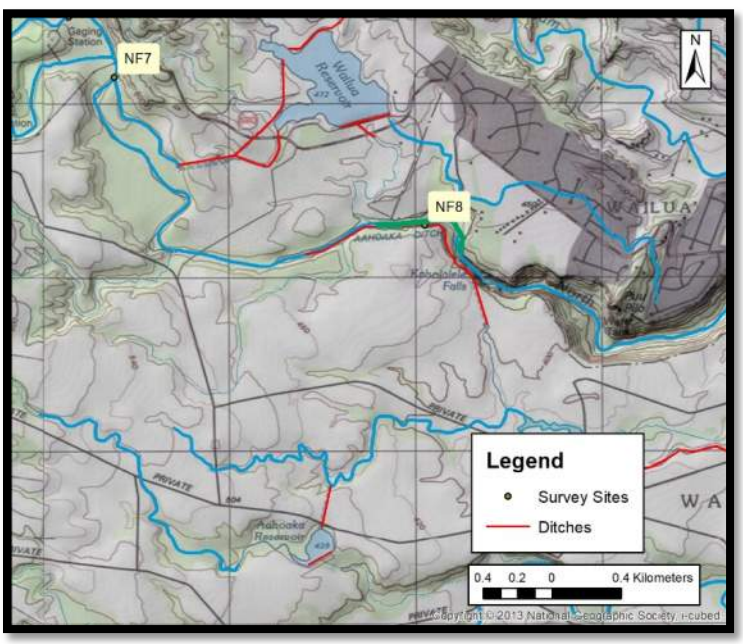


Figure 59: Map and flow measurement location for the Monastery sampling area (NF8) on June 17, 2018. Red lines are ditches and the green line is the survey area.

Figure 60: Monastery flow measurement location.

Table 13: Discharge measurements for NF8 site.

Location	Site Code	Date	Total Width (ft)	Total Discharge (cfs)
Monastery	NF8	6/17/2018	46.7	80.5

Table 14: Water quality measurements completed at the Monastery sampling area.

Location	Code	Date	Temp (°C)	Sp. Conductivity (µS/cm)	DO (mg/l)	Turbidity (NTU)
North Fork of Wailua River near Monastery	NF8	6/17/2018	24.9	93	8.42	1.68

Figure 61: Monastery sampling area above falls looking downstream.

Figure 62: Monastery sampling area above falls looking upstream.

Figure 63: Large smallmouth bass observed in the monastery sampling area (NF8).

Figure 64: Tahitian prawn observed in the monastery sampling area (NF8).

Lower North Fork of the Wailua River (NF9)

Below is a site surveyed on the North Fork of the Wailua River which was located below Kaholalele falls and was accessed by canoe on June 20, 2018 (Figure 65). The intent at this location was to document stream animals. No discharge or water quality was measured at this location. The habitat was a mix of pool and riffle with cobble and boulder substrate (Figure 66). Both native and introduced species were common at this location. We observed the native stream species, ʻOʻopu nakea (*Awaous stamenius*), ʻOʻopu naniha (*Stenogobius Hawaiiensis*), ʻOʻopu akupa (*Eleotris sandvicensis*), ʻŌpae oehaʻa (*Macrobrachium grandimanus*) and aholehole (*Kuhlia xenura*) (Figure 68, Figure 69). We also observed tilapia, smallmouth bass, Tahitian prawn, guppies, green swordtails, and cane toads at the site (Figure 67).

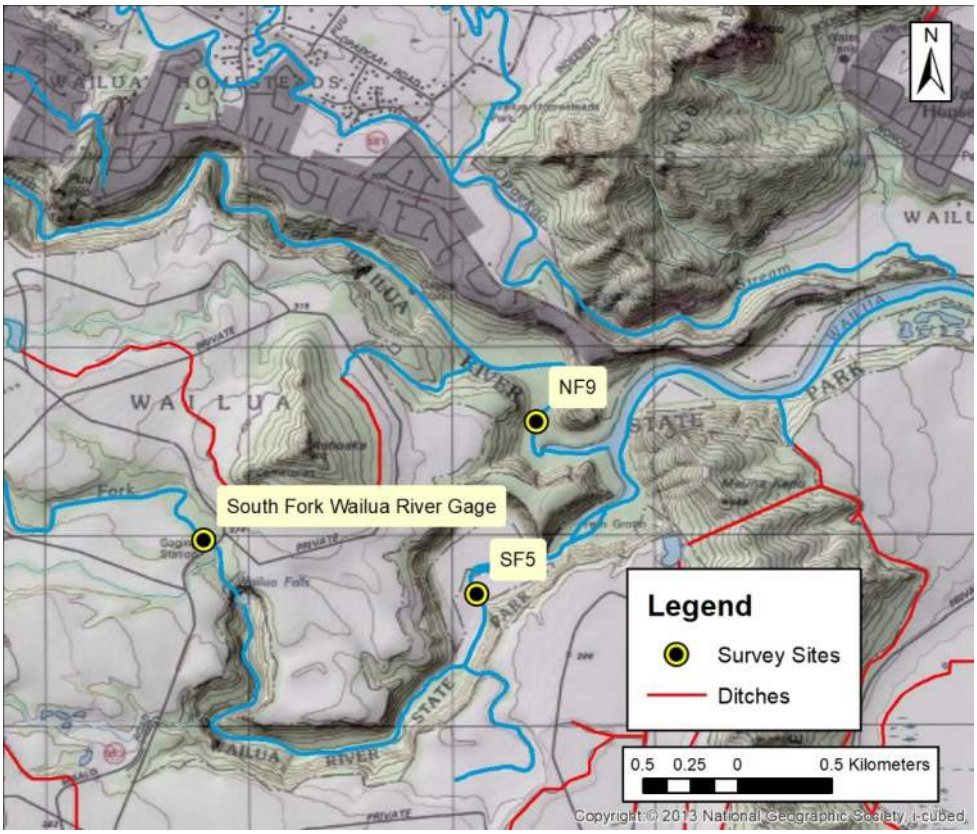


Figure 65:Map of the lower North Fork of the Wailua River site (NF9) on 6-20-2018.

Figure 66: Example of the habitat surveyed in the lower reach of the North Fork of the Wailua River.

Figure 67: Lowest point on North Fork Survey where Brett Connell sampled a Tilapia.

Figure 68: Native species, Aholehole and oʻopu nakea observed at this location

Figure 69: Native species, ʻOʻopu naniha observed in the lower North Fork of the Wailua River

Results for South Fork Habitat and Biota Surveys

South Fork Results:

We surveyed the South Fork of the Wailua River in Waikoko, Iliʻiliʻula, and Waiahi tributaries and in the main stem of the South Fork below Wailua Falls. (Figure 70). The list of sites can be found in Table 2 and site attributes are summarized in the following tables:

- list of species observed (Table 15),
- distribution of habitat types (Table 16),
- distribution of water depth (Table 17),
- distribution of substrate types (Table 18), and
- distribution of the wetted width of the stream channel (Table 19).

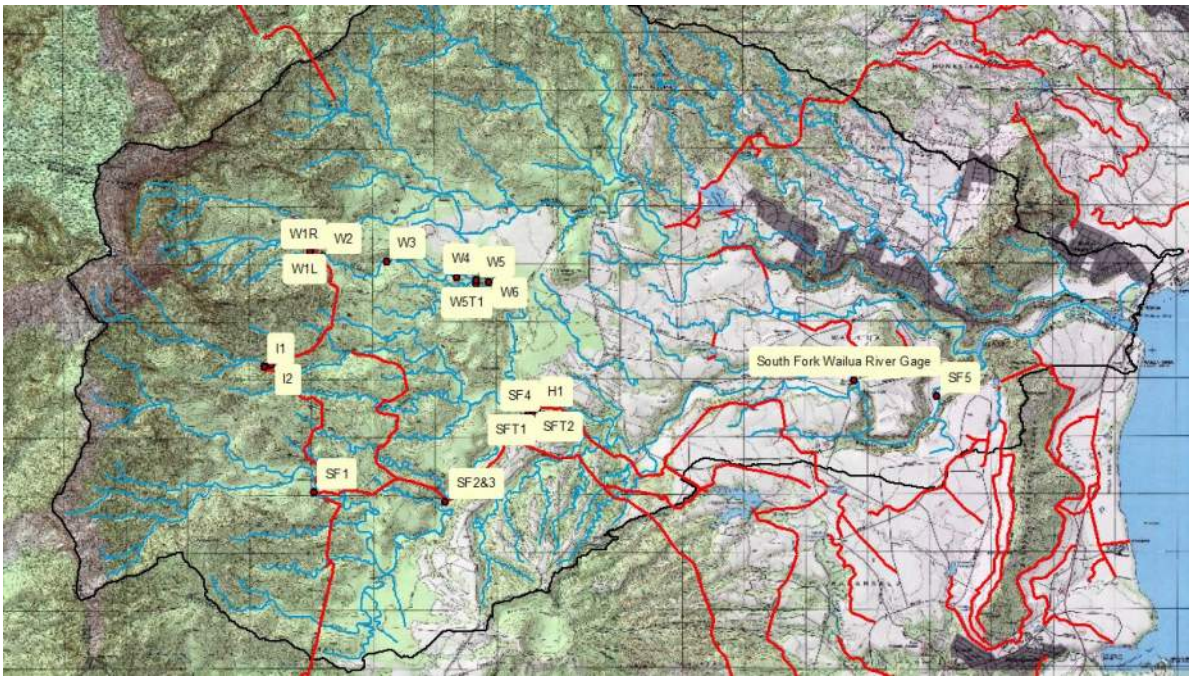


Figure 70: Map and locations of the major sampling areas on the South Fork of the Wailua River.

Table 15: Species observed during surveys on the South Fork of the Wailua River.

South Fork of the Wailua River																		
		Native Species										Introduced Species						
Site	Description	AB	LC	AS	SS	NG	ES	SH	MG	EN	Damselfly sp.	MD	ML	PR	XH	PC	BM	RC
W1L	Waikoko Stream above Diversion Left Fork	C	-	-	-	-	-	-	-	-	-	-	P	C	-	-	-	-
W1R	Waikoko Stream above Diversion Right Fork	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	Waikoko Stream below Diversion	P	-	-	-	-	-	-	-	-	-	-	P	C	-	-	-	P
W3	Waikoko Stream mid reach	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-
W4	Waikoko Stream low reach	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-
I1	Ili'ili'ula Stream above Diversion	C	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-	P
I2	Ili'ili'ula Stream below Diversion	P	-	-	-	-	-	-	-	-	-	-	P	C	-	P	-	P
I2T	Tributary to Ili'ili'ula Stream	C	-	-	-	-	-	-	-	-	-	-	P	-	-	P	P	-
SF1	Waiahi Stream below Upper Hydro Return	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-
SF2	Waiahi Stream above Lower Hydro Return	-	-	-	-	-	-	-	-	-	-	C	P	-	P	-	-	-
SF3	Waiahi Stream below Lower Hydro Return	-	-	-	-	-	-	-	-	-	-	C	P	-	P	-	-	-
SF4	South Fork of Wailua River at Hanamaulu Diversion	-	-	-	-	-	-	-	-	-	-	C	P	-	-	-	-	-
SF5	South Fork of Wailua River below Wailua Waterfall	-	P*	C	-	-	C	C	-	-	-	P	P	P	-	-	P	-

C = Common, P = Present, - = not observed. *migrating post-larval fish

Native Species: AB = ʻŌpae kalaʻole (*Atyoida bisulcata*), LC = ʻOʻopu alamoʻo (*Lentipes concolor*) AS = ʻOʻopu nakea (*Awaous stamenius*), SS = ʻOʻopu nōpili (*Sicyotperus stimpsoni*), NG = Hihiwai *(Neritina granosa*), ES = ʻOʻopu akupa (*Eleotris sandvicensis*), SH = ʻOʻopu naniha (*Stenogobius Hawaiʻi ensis*), MG = ʻŌpae oehaʻa (*Macrobrachium grandimanus*), EN = Newcomb's snail (*Erinna newcombi*).

Introduced Species: MD = Smallmouth Bass (*Micropterus dolomieu)*, ML = Tahitian prawn (*Macrobrachium lar*), PR = Guppy (*Poecilia reticulata)*, XH = Green Swordtail (*Xiphophorus hellerii)*, PC = Crayfish (*Procambarus clarkii*), BM = Cane Toad (*Bufo marinus*), RC = Bull Frog (*Rana catesbeiana*).

Table 16: Habitat Type percentages for survey sites on the South Fork of the Wailua River.

South Fork of the Wailua River									
		Habitat Type %							
Site	Description	Pool	Run	Riffle	Cascade	Falls	Side Pool	Dry	Total
W1L	Waikoko Stream above Diversion Left Fork	0%	80%	20%	0%	0%	0%	0%	100%
W1R	Waikoko Stream above Diversion Right Fork	38%	25%	25%	13%	0%	0%	0%	100%
W2	Waikoko Stream below Diversion	20%	33%	20%	0%	0%	27%	0%	100%
W3	Waikoko Stream mid reach	25%	44%	31%	0%	0%	0%	0%	100%
W4	Waikoko Stream low reach	28%	44%	28%	0%	0%	0%	0%	100%
I1	Ili'ili'ula Stream above Diversion	36%	21%	21%	21%	0%	0%	0%	100%
I2	Ili'ili'ula Stream below Diversion	0%	25%	0%	0%	0%	75%	0%	100%
I2T	Tributary to Ili'ili'ula Stream	50%	21%	21%	7%	0%	0%	0%	100%
SF1	Waiahi Stream below Upper Hydro Return	27%	45%	27%	0%	0%	0%	0%	100%
SF2	Waiahi Stream above Lower Hydro Return	31%	46%	23%	0%	0%	0%	0%	100%
SF3	Waiahi Stream below Lower Hydro Return	0%	80%	20%	0%	0%	0%	0%	100%
SF4	South Fork of Wailua River at Hanamaulu Diversion	42%	32%	26%	0%	0%	0%	0%	100%
SF5	South Fork of Wailua River below Wailua Waterfall	57%	29%	14%	0%	0%	0%	0%	100%

Table 17: Water Depth classes for survey sites on the South Fork of the Wailua River.

South Fork of the Wailua River										
		Water Depth in Thalweg (inches)								
Site	Description	Dry	< 1	1-3	3-6	6-12	12-24	24-36	> 36	total
W1L	Waikoko Stream above Diversion Left Fork	0%	0%	0%	0%	17%	50%	17%	17%	100%
W1R	Waikoko Stream above Diversion Right Fork	0%	0%	0%	0%	25%	38%	25%	13%	100%
W2	Waikoko Stream below Diversion	0%	0%	0%	0%	27%	40%	27%	7%	100%
W3	Waikoko Stream mid reach	0%	0%	0%	0%	20%	53%	27%	0%	100%
W4	Waikoko Stream low reach	0%	0%	0%	0%	11%	28%	44%	17%	100%
I1	Ili'ili'ula Stream above Diversion	0%	0%	0%	0%	0%	31%	23%	46%	100%
I2	Ili'ili'ula Stream below Diversion	27%	18%	27%	18%	9%	0%	0%	0%	100%
I2T	Tributary to Ili'ili'ula Stream	0%	0%	0%	14%	36%	29%	7%	14%	100%
SF1	Waiahi Stream below Upper Hydro Return	0%	0%	0%	0%	13%	48%	22%	17%	100%
SF2	Waiahi Stream above Lower Hydro Return	0%	0%	0%	0%	0%	43%	29%	29%	100%
SF3	Waiahi Stream below Lower Hydro Return	0%	0%	0%	0%	10%	70%	20%	0%	100%
SF4	South Fork of Wailua River at Hanamaulu Diversion	0%	0%	0%	0%	12%	35%	12%	41%	100%
SF5	South Fork of Wailua River below Wailua Waterfall	0%	0%	0%	0%	11%	22%	22%	44%	100%

Table 18: Bottom Substrate percentages for survey sites on the South Fork of the Wailua River.

South Fork of the Wailua River															
		Bottom Substrate													
Site	Description	Fine/silt	Sand	Gravel	Small Mix	Cobble	Small Boulder	Med. Mix	Large Boulder	Bedrock	Large Mix	Full Mix	Man made	Unknown	Total
W1L	Waikoko Stream above Diversion Left Fork	0%	0%	0%	0%	0%	0%	25%	0%	0%	25%	50%	0%	0%	100%
W1R	Waikoko Stream above Diversion Right Fork	0%	0%	0%	0%	25%	0%	50%	13%	0%	13%	0%	0%	0%	100%
W2	Waikoko Stream below Diversion	0%	0%	0%	23%	8%	0%	38%	0%	0%	15%	15%	0%	0%	100%
W3	Waikoko Stream mid reach	0%	0%	0%	0%	27%	0%	47%	7%	0%	13%	7%	0%	0%	100%
W4	Waikoko Stream low reach	0%	0%	0%	0%	28%	0%	67%	0%	0%	6%	0%	0%	0%	100%
I1	Ili'ili'ula Stream above Diversion	0%	0%	0%	8%	0%	0%	31%	46%	0%	15%	0%	0%	0%	100%
I2	Ili'ili'ula Stream below Diversion	0%	0%	0%	0%	9%	0%	27%	36%	0%	27%	0%	0%	0%	100%
I2T	Tributary to Ili'ili'ula Stream	0%	0%	0%	0%	6%	6%	31%	25%	0%	31%	0%	0%	0%	100%
SF1	Waiahi Stream below Upper Hydro Return	0%	5%	0%	14%	43%	0%	38%	0%	0%	0%	0%	0%	0%	100%
SF2	Waiahi Stream above Lower Hydro Return	0%	0%	0%	0%	29%	0%	57%	14%	0%	0%	0%	0%	0%	100%
SF3	Waiahi Stream below Lower Hydro Return	0%	0%	0%	10%	20%	0%	70%	0%	0%	0%	0%	0%	0%	100%
SF4	South Fork of Wailua River at Hanamaulu Diversion	0%	0%	0%	6%	24%	0%	65%	6%	0%	0%	0%	0%	0%	100%
SF5	South Fork of Wailua River below Wailua Waterfall	0%	13%	0%	13%	50%	0%	25%	0%	0%	0%	0%	0%	0%	100%

Table 19: Wetted width percentages for survey sites on the South Fork of the Wailua River.

South Fork of the Wailua River										
		Wetted Width (%)								
Site	Description	Dry	1-10%	10-20%	20-40%	40-60%	60-80%	80-100%	Unknown	Total
W1L	Waikoko Stream above Diversion Left Fork	0%	0%	0%	0%	0%	20%	80%	0%	100%
W1R	Waikoko Stream above Diversion Right Fork	0%	0%	0%	0%	0%	0%	100%	0%	100%
W2	Waikoko Stream below Diversion	0%	0%	0%	0%	15%	8%	77%	0%	100%
W3	Waikoko Stream mid reach	0%	0%	0%	0%	0%	9%	91%	0%	100%
W4	Waikoko Stream low reach	0%	0%	0%	0%	0%	7%	93%	0%	100%
I1	Ili'ili'ula Stream above Diversion	0%	0%	0%	0%	0%	18%	82%	0%	100%
I2	Ili'ili'ula Stream below Diversion	30%	50%	20%	0%	0%	0%	0%	0%	100%
I2T	Tributary to Ili'ili'ula Stream	0%	0%	0%	14%	36%	36%	14%	0%	100%
SF1	Waiahi Stream below Upper Hydro Return	0%	0%	0%	0%	5%	18%	77%	0%	100%
SF2	Waiahi Stream above Lower Hydro Return	0%	0%	0%	0%	0%	0%	100%	0%	100%
SF3	Waiahi Stream below Lower Hydro Return	0%	0%	0%	0%	0%	0%	100%	0%	100%
SF4	South Fork of Wailua River at Hanamaulu Diversion	0%	0%	0%	0%	13%	13%	73%	0%	100%
SF5	South Fork of Wailua River below Wailua Waterfall	0%	0%	0%	0%	0%	33%	67%	0%	100%

Waikoko Stream

We surveyed three general areas on Waikoko Stream. Sites W1L, W1R, W2 were found above and below the Waikoko stream diversion. Site W3 was in the middle of the survey section, and sites W4 through W6 were at the lower end of the section. Water quality appeared good at all sites (Table 20).

Two forks of Waikoko Stream flowed into the diversion. The stream was steep and full of boulders above the diversion. ʻŌpae kalaʻole (*Atyoida bisulcata*) were common in both forks above the diversion (Table 15). We also observed Tahitian prawn and guppies above the diversion. In the segment below the diversion, the same three species were observed although ʻōpae kalaʻole were less commonly observed than above the diversion.

In the middle segment (W3), instream habitat appeared good with a mix of runs, riffles and pools containing adequate water depths and a mix of cobble and boulder substrate (Table 16 to Table 18). We observed damselflies at this location, but no other native stream species. We did observe smallmouth bass (*Micropterus dolomieu)* and Tahitian prawn (*Macrobrachium lar*).

In the lower segment of Waikoko Stream, we covered a long segment during our surveys. Habitat types were mixed between runs, riffles and pools with over 60% of the sites greater than 24 inches deep (Table 16 and Table 17). Like the other sites we surveyed on Waikoko Stream, the substrate was a mix of cobble and boulder (Table 18) and much of the channel width was wetted (Table 19). We did not observe any native amphidromous stream animals at the site, although we did observe smallmouth bass (*Micropterus dolomieu)* and Tahitian prawn (*Macrobrachium lar*).

Figure 71: Map of Waikoko Stream sample locations.

Table 20: Water quality measurements for Waikoko Stream sites.

Location	Site Code	Date	Unit	Temp	Sp. Cond (uS/cm)	Dissolved Solids	pH
Waikoko Diversion	W1	6/19/2018	Horiba	19.8	0.078	0.051	7.66
Waikoko Crossing	W3	6/19/2018	Horiba	20.73	0.08	0.052	7.37
Waikoko Lower	W6	6/19/2018	Horiba	20.73	0.081	0.053	7.22

Figure 72: Habitat conditions upstream of the Waikoko Diversion (W1R)

Figure 73: Habitat conditions below the Waikoko Diversion downstream of sluice gate that returns water to stream.

Figure 74: Habitat conditions in mid reach of Waikoko (W3).

Figure 75: Guppies observed in mid reach of Waikoko (W3).

Figure 76: Habitat conditions in Waikoko Stream low-reach (W4)

Figure 77: Tahitian prawn in Waikoko Stream low-reach (W4)

Iliʻiliʻula Stream (I1, I2 and I2T)

We surveyed above (I1) and below (I2) the diversion on Iliʻiliʻula Stream and in a small tributary that flowed into Iliʻiliʻula Stream below the diversion (I2T). We also conducted surveys within the diversion tunnels on both sides of the diversion pool and in a daylighted portion of the ditch near I2T over several days between June 18 and 20, 2018. Water flowed in the ditch from Waikoko Stream to the diversion site on Iliʻiliʻula Stream and then flowed down ditch toward the upper hydropower facility (Figure 79). Most of the Iliʻiliʻula Stream water was captured by the stream diversion with a small amount flowing downstream. The Iliʻiliʻula Stream Diversion had a small hole (approximately 4 in. diameter) to allow water to flow past the dam. We measured discharge of 13.55 cfs above the diversion location but did not measure discharge below the diversion as the water flowed into and around boulders downstream of the diversion preventing an accurate measurement. However, it was visually estimated to be less than 1 cfs (Figure 78). Water quality measurement showed good water temperature, specific conductivity and total dissolved solids at all sites (Table 21).

The instream habitat was markedly different above and below the diversion. Above the diversion, pools were common with swift water runs, riffles and cascades interspersed (Figure 80). Below the diversion, disconnected side pools were most common as a result of the decreased flow volume passing the diversion (Figure 81). The difference in water availability was also apparent in the water depth and wetted width. Above the diversion, more than 2/3 of the survey area was greater than 24 in. deep and most of the width of the channel was wetted, while below the diversion, more than 90% of the area was less than 6 in. deep with less than 20% of the channel wetted. There was little different in substrate availability above or below the diversion as it was predominantly a mix of boulder and cobble substrate.

The small tributary was steep and had a mix of pools and small waterfalls flowing over large boulders and cobble substrate. The channel was generally about 1 foot deep with approximately 50% to 80% of the channel width wetted. While small, the tributary appeared to have good habitat conditions (Figure 82).

ʻŌpae kalaʻole (*Atyoida bisulcata*) were present at all locations we surveyed in this area (Figure 83). They were common above the diversion, within the diversion tunnels, and in the small tributary stream. We observed numerous small and large ʻōpae kalaʻole as well as gravid females suggesting that conditions are highly suitable for this native species (Figure 84). ʻŌpae kalaʻole were present below the diversion, but in lower numbers. We observed Tahitian prawn, guppies, green swordtails, cane toad, crayfish and bullfrog tadpoles in this area also with guppies being the most common of these species below the diversion. We also observed unidentified egg masses in the tributary stream likely from wrinkled frogs.

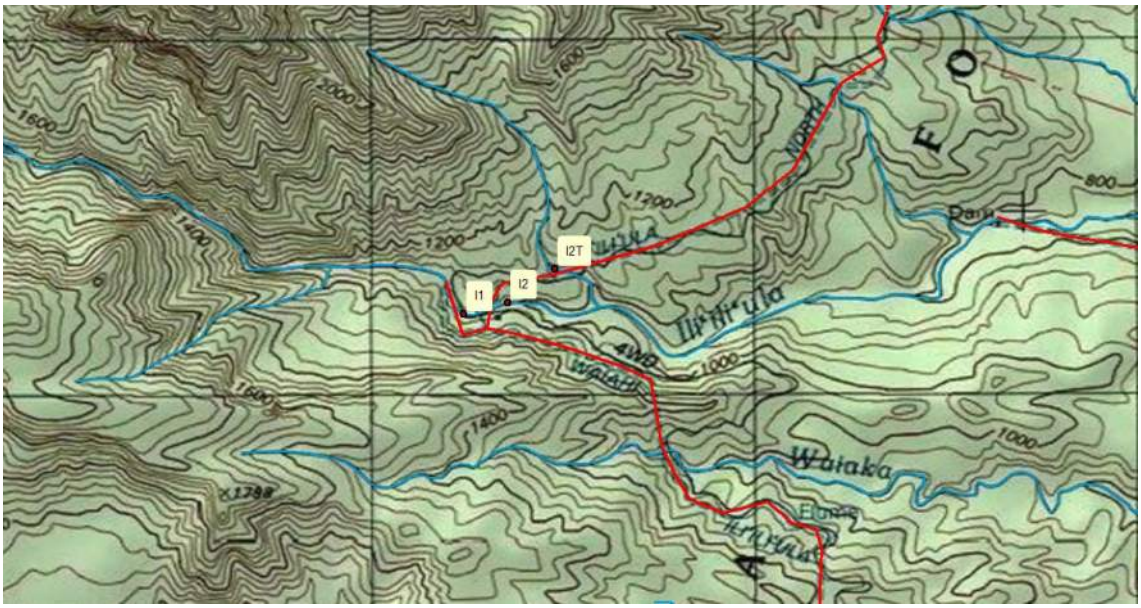


Figure 78: Map and flow measurement location for the Iliʻiliʻula Stream sampling area for June 18-19, 2018. Above Iliʻiliʻula Diversion (SF1): 22.040162, -159.474184, Below Iliʻiliʻula Diversion (SF2): 22.039807, -159.473518.

Table 21: Water Quality measurement for Iliʻiliʻula Stream completed on June 18, 2018.

Location	Site Code	Date	Unit	Temp	Sp. Cond (uS/cm)	Dissolved Solids	pH
Above Ili'ili'ula Diversion	I1	06/18/18	Horiba	17.65	0.075	0.049	7.49
Below Ili'ili'ula Diversion	I2	06/18/18	Horiba	18.44	0.082	0.053	7.44
Small Ili'ili'ula Tributary	I2T	06/20/18	Horiba	20.34	0.078	0.051	7.36

Figure 79: Diversion pool on Iliʻiliʻula Stream with incoming ditch (a), out-going ditch (b) and bypass flow (c).

Figure 80: Plunge-pool habitat upstream of the Iliʻiliʻula diversion on June 18, 2018.

Figure 81: Habitat downstream of the Iliʻiliʻula diversion.

Figure 82: Example habitat in small tributary I2T.

Figure 83: ʻŌpae kalaʻole under rocks upstream of diversion.

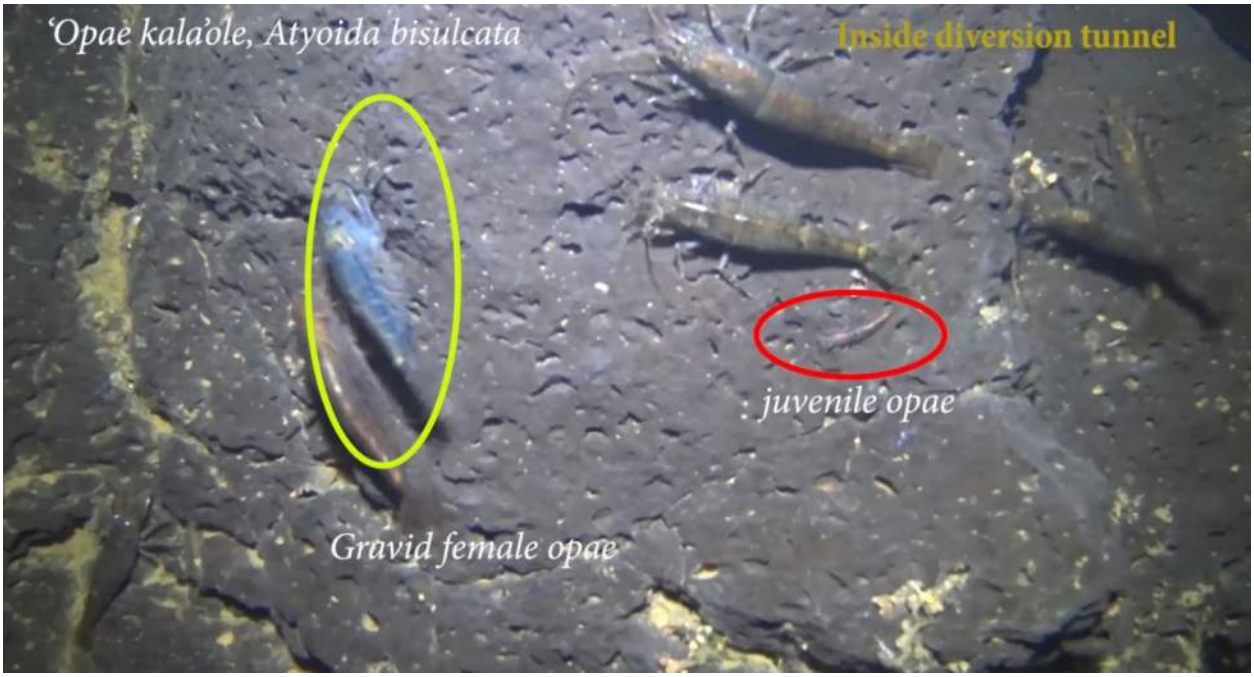


Figure 84: '‘Ōpae kalaʻole inside of the diversion tunnel.

Figure 85: Crayfish in the ditch between Iliʻiliʻula and Waikoko Streams.

Waiahi Stream below Upper Hydro return (SF1)

Waiahi Stream, below the Upper Hydro return sampling area, was surveyed between the upper powerhouse return and the lower powerhouse intake on June 18, 2018 (Figure 86). Toward the downstream end of the survey area there was a small dam crossing the stream. During the survey of this area, neither the upper nor the lower powerhouses were generating. We measured discharge below the lower powerhouse intake and recorded 40.64 cfs at this location. Water quality was generally good (Table 22).

Run type habitat (45%) was the most common habitat type at the site with an even mix of pools and riffles accounting for the rest the habitat units (Figure 88). In general, the channel was full of water and the pools were deep (Figure 87). This location had more fine substrates than most survey locations and they were found to be associated with the deeper pools. Cobble and a mix of medium-size substrate were the most frequent substrate categories recorded.

Smallmouth bass were the only species we observed at this location and they were common (Figure 91). We observed small and large-sized bass in all of the pools surveyed. No other species were observed at the site.

Table 22: Water quality measurement for Waiahi Stream near Upper Hydro on June 18, 2018.

Location	Site Code	Date	Unit	Temp	Sp. Cond (uS/cm)	Dissolved Solids	pH
Waiahi Stream near Upper Hydro	SF1	06/18/18	Horiba	18.5	0.084	0.054	7.02

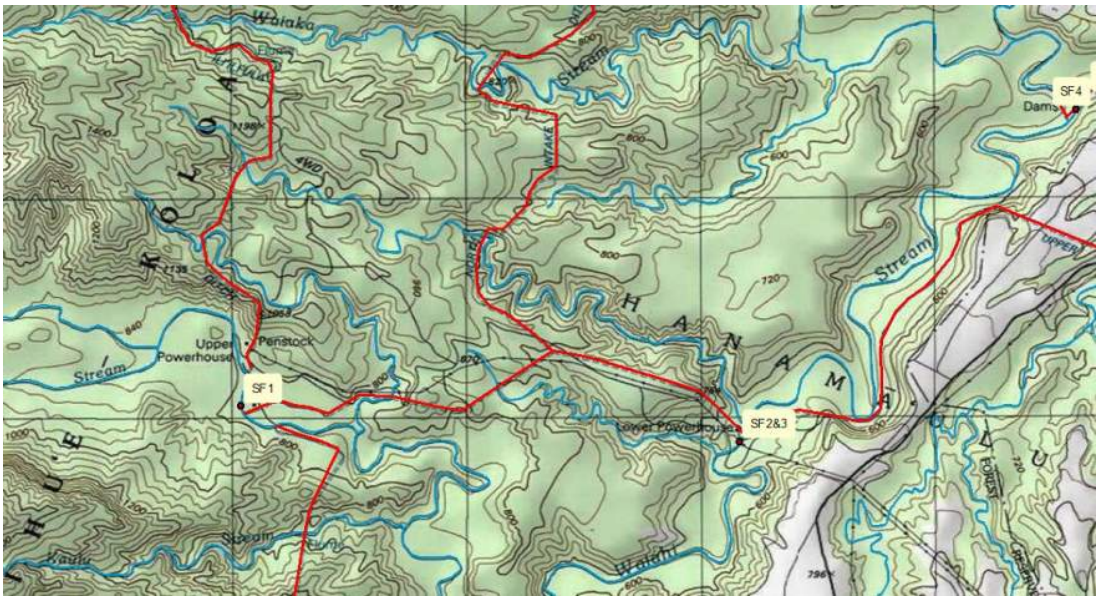


Figure 86: Map and flow measurement location for SF1 sampling area on June 18, 2018, at 22.019054, -159.464609.

Figure 87: The “fishing hole” on Waiahi Stream immediately downstream of the Upper Hydro return. The maximum water depth was approximately 8 feet deep at this location.

Figure 88: Riffle-run habitat below diversion at SF1 sampling area.

Figure *89*: Lower Hydro Intake on Waiahi Stream near downstream end of the survey area.

Figure 90: Dr. James Parham completing the High Definition Stream Survey while snorkeling Waiahi Stream. Note the GPS on the back to track continuous position associated with all surveys.

Figure 91: Smallmouth bass observed in a deep pool downstream of the upper hydro return.

Waiahi Stream above and below the Lower Hydropower Return (SF2 and SF3)

We surveyed the area both above and below the lower hydropower return on Waiahi Stream (Figure 93). As with the other sites we surveyed, neither hydropower station was generating during the survey. We measured discharge of 67.2 cfs just above the low-water road crossing (Figure 92, Figure 94). Waiahi Stream was 81.5 feet wide at this location. Water quality appeared good throughout this area (Table 23).

We observed the same species both above and below the lower hydropower return. Smallmouth Bass were the most common species and Tahitian prawn and green swordtails were present (Figure 95). No native amphidromous stream animals were observed at this location.

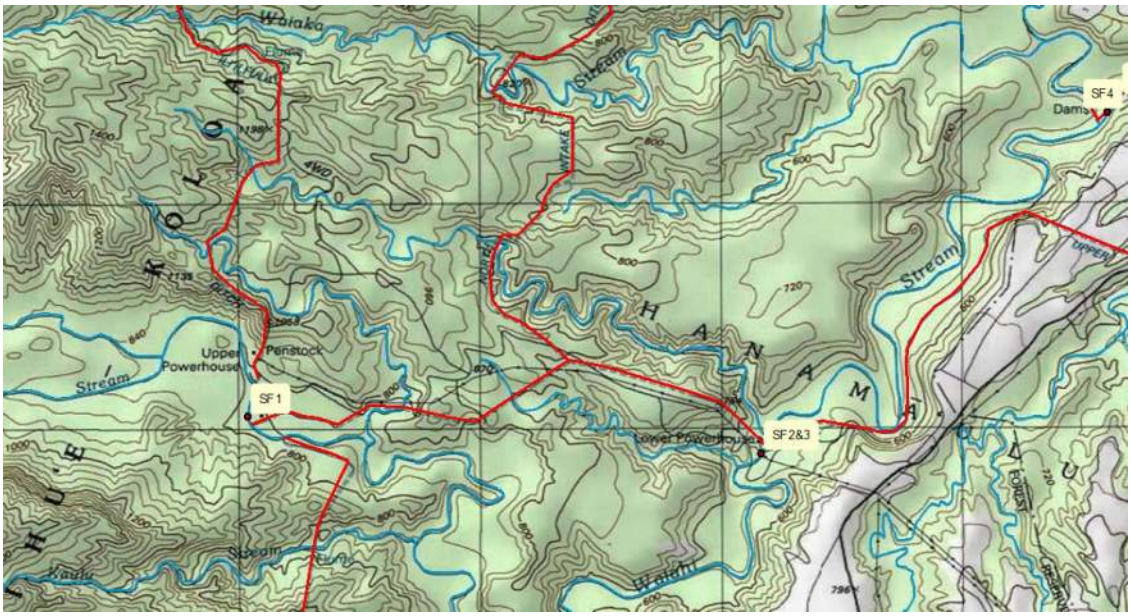


Figure 92 Map and flow measurement location for Lower Waiahi Crossing sampling area on June 18-19, 2018. Waiahi Stream crossing (SF4) 22.017441, -159.444570

Table 23: Water Quality measurements for Waiahi Stream near Lower Hydro on June 18, 2018.

Location	Site Code	Date	Unit	Temp	Sp. Cond (uS/cm)	Dissolved Solids	pH
Waiahi Stream near Lower Hydro	SF2	06/18/18	Horiba	19.45	0.087	0.057	7.33

Figure 93: Stream pool where lower hydropower return flow enters Waiahi Stream (on right). On left is the intake for the Upper Līhuʻe Ditch.

Figure 94: Waiahi Stream road crossing and location of the flow measurement transect on June 18, 2018.

Figure 95: Tahitian prawn in Waiahi Stream.

Hanamāʻulu Diversion Sampling Area (SF4)

The Hanamāʻulu Diversion sampling area was at the confluence of the Waiahi and Iliʻiliʻula Streams which combined to form the South Fork of the Wailua River (Figure 101). Iliʻiliʻula Stream captures flow from Waiaka stream, Waikoko Stream and flows down the lower segment of the Stable Storm Ditch. Diversions on both the Waiahi and Iliʻiliʻula Streams created large pool habitats upstream and a short bypass canal allowed water to flow from Iliʻiliʻula Stream to Waiahi Stream above the diversion. Below the diversions, a more typical riffle-run-pool sequence was observed. We recorded a stream discharge below each diversion, and in the bypass channel (Figure 97, Figure 98, Figure 99, Figure 100). Approximately 40.6 cfs flowed downstream from this location and (Figure 96). Water quality again appeared good at this location (Table 24).

Above the two diversions, finer substrates were observed, while below the diversions a mix of medium sized substrate was observed. Water depth and wetted width were good and overall there were substantial amounts of suitable habitat in this location. We did not survey very far up Iliʻiliʻula Stream, but instream habitat appeared to be least suitable in this area as it was shallower and had greater amounts of fine sediment on the channel bottom.

We observed numerous smallmouth bass and Tahitian prawn at this location both above and below the diversions (Figure 102). Smallmouth bass were observed fanning out nests prior to spawning. No native amphidromous species were observed at the site.

Table 24: Water Quality measurement for Waiahi Stream at the Hanamāʻulu Diversion sampling area completed on June 18, 2018.

Location	Site Code	Date	Unit	Temp	Sp. Cond (uS/cm)	Dissolved Solids	pH
Waiahi Stream Below Hanamāʻulu Diversion	SF4	06/18/18	Horiba	20.37	0.09	0.059	7.25

Figure 96: Map and flow measurement location for Lower Waiahi Crossing sampling area on June 18-19, 2018. Waiahi Stream below Hanamāʻulu Diversion (SF4): 22.032025, -159.430087, connector ditch to Waiahi (SFT1): 22.032066, -159.430747, Iliʻiliʻula Stream below Diversion (SFT2): 22.032098, -159.430409, Hanamāʻulu Ditch (H1): 22.032791, -159.428991.

Table 25: Discharge information associated with the surveys near the Hanamāʻulu Diversion area.

Location	Site Code	Date	Lat	Lon	Stream Width (ft)	Discharge (ft^3/s)
Connector Ditch to Waiahi Stream	SFT1	06/18/19	22.032066	-159.430747	8	6.1
Ili'ili'ula Stream Below Diversion	SFT2	06/18/19	22.032098	-159.430409	17	24.27
Waiahi Stream Below Hanamāʻulu Div.	SF4	06/18/19	22.032025	-159.430087	38	16.3

Figure 97: Flow measurement location for Waiahi Stream below Hanamāʻulu Diversion (SF4).

Figure 98: Flow measurement location for connector Ditch to Waiahi Stream (SFT1).

Figure 99: Flow measurement location for Iliʻiliʻula Stream below Hanamāʻulu Diversion (SFT2).

Figure 100: Water flowing in the Hanamāʻulu Ditch (H1).

Figure 101: Looking at the confluence of Waiahi and Iliʻiliʻula Streams where the South Fork of the Wailua River begins.

Figure 102: Smallmouth bass observed eating large Tahitian prawn in the Hanamāʻulu Diversion area.

Lower South Fork Sampling Area (SF5)

The survey site on the lower South Fork of the Wailua River was accessed by canoe with the goal of determining if any native species were found in the lower reach (Figure 103). Thus only habitat and biota were surveyed at the site. This site was the first riffle area as we traveled upstream on the South Fork of the Wailua River (Figure 104). The gradient here was lower than most other surveyed sites and the substrate was a mix of sand, gravel, cobble and a few boulders (Figure 105). The channel was full of water and was about 1 ft deep in the riffles and greater than 3 ft in the pool areas.

We observed numerous adult ʻoʻopu nakea (*Awaous stamenius*), ʻoʻopu akupa (*Eleotris sandvicensis*), ʻoʻopu naniha (*Stenogobius hawaiiensis*) and aholehole (*Kuhlia xenura*) at this location (Figure 106, Figure 107, Figure 108). We also observed recruiting post-larval ʻoʻopu alamoʻo (*Lentipes concolor*) and ʻoʻopu naniha (*Stenogobius hawaiiensis*) confirming that recruitment of native fishes was occurring in the Wailua River system. We also observed introduced smallmouth bass, Tahitian prawn, guppies, tilapia and cane toad eggs and tadpoles.

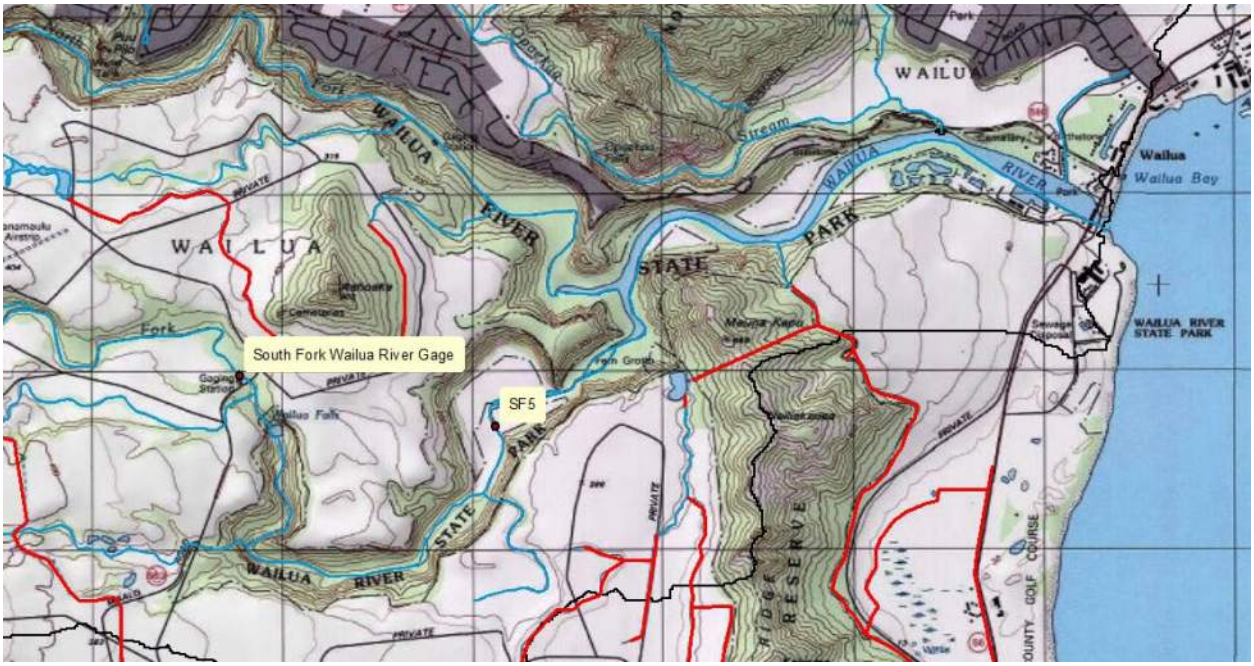


Figure 103: Map and furthest upstream HDFS sampling location for the Lower SF Wailua River. 22.035169, -159.367493.

Figure 104: Looking upstream toward the downstream most riffle on the South Fork Wailua River (SF5).

Figure 105: Looking downstream at the site SF5 on the South Fork Wailua River.

Figure 106: Native fish ʻoʻopu nakea and Aholehole in the lower South Fork of the Wailua River.

Figure 107: Native fish oʻopu 'akupa in the lower South Fork of the Wailua River.

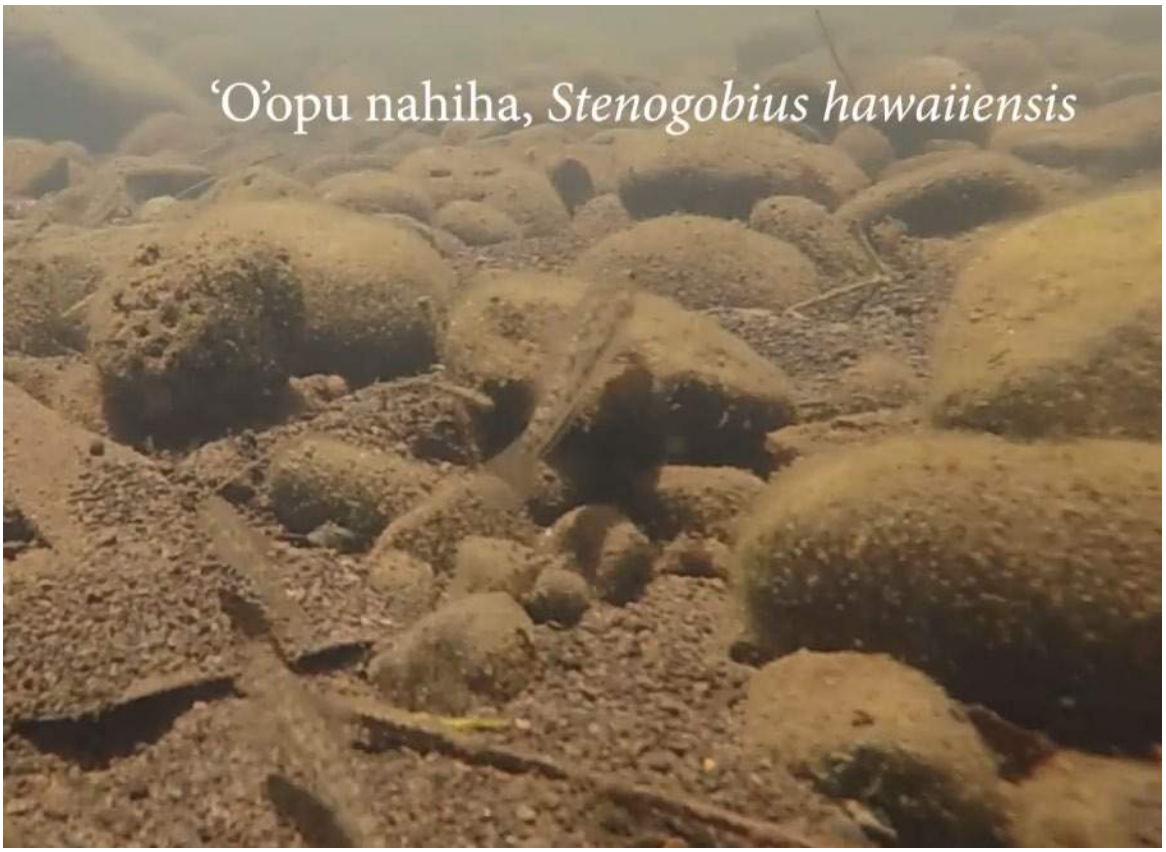


Figure 108: Native fish oʻopu naniha in the lower South Fork of the Wailua River.

Habitat and Biota Surveys: Conclusions:

The focus of this work was aimed at determining habitat use and availability for the native amphidromous stream species to better understand their distribution within the Wailua River system. At each site, we gathered habitat information and visual surveys of species present in February and June of 2018. On the North Fork of the Wailua River, we surveyed nine different areas from the uppermost site above the North Fork Diversion to the furthest downstream site below Kaholalele Waterfall, the first large waterfall on the river. On the South Fork of the Wailua River, we gathered information at 12 different locations split between the upper sites near the diversions on Waikoko, Iliʻiliʻula, and Waiahi Streams and sites downstream on the South Fork with the lowest site located downstream of the large Wailua Waterfall.

We observed consistent patterns in both the habitat and the species occurrence from upstream to downstream sites on the North and South Forks of the Wailua River. Instream habitat was generally good throughout the Wailua River system, with localized issues in the dewatered areas immediately downstream of the Iliʻiliʻula – North Wailua Ditch diversions.

The sites can be separated into four different categories with similar habitat and species composition: upper sites, upper mid-reach sites, mid-reach sites and low reach sites.

Upper Sites: The upper sites were found in the upper reaches of both the North and South Fork streams. This included sites in the North Fork Wailua River (North Fork sites NF1 and NF2), Waikoko and Iliʻiliʻula Streams (South Fork sites W1L, W1R, W2, I1, I2 and I2T) above and below the Iliʻiliʻula – North Wailua Ditch diversions. The streams at these locations were relatively steep with the stream forming a mix of plunge pools, runs, riffles and cascades as it flowed through mostly boulder and cobble substrate. Overall, conditions upstream of the diversions appeared excellent for native stream animals.

The primary difference among these sites was that the sites immediately below the diversions were much shallower and narrower than those above the diversion, with a much lower percent of the stream channel filled with water (Figure 109). The lack of water below the diversions was a direct result of most of the water flowing into the ditch and not downstream. During the June survey of Waikoko Stream, water was returned to the stream from ditch sluice gate approximately 75 m downstream of the diversion location. Below the diversion but prior to the water return, the stream was primarily disconnected pools with little flow between them. After the water return, the stream quickly returned to a mix of pools, runs and riffles. Below the North Fork (February survey) and Iliʻiliʻula diversions (June survey), the small amount of water passing the diversion resulted in poorer stream habitat for much further downstream. Interestingly, springs and seeps along the channel contributed to the stream flow and habitat conditions improvement further downstream of the diversions.

At the upper sites, the most common species observed was the native shrimp, ʻōpae kalaʻole (*Atyoida bisulcata*) (Figure 110). ʻŌpae kalaʻole were documented above and below the diversions at North Fork, Waikoko (South Fork) and Iliʻiliʻula Streams (South Fork). ʻŌpae kalaʻole were in much higher densities above the diversions than below the diversions and were only observed in low numbers in a few pools immediately below the diversions. Overall, ʻōpae kalaʻole were more numerous above the diversions on Waikoko and Iliʻiliʻula Streams than above the diversion on the North Fork Wailua. ʻŌpae kalaʻole presence above the North Fork Diversion indicated they were able to migrate up the North Fork of the Wailua River or through the Iliʻiliʻula – North Wailua Ditch from the South Fork.

No native gobies or snails were documented during our survey. We searched the main channel and seeps that flowed into the streams above and below the diversions for Newcomb's snails (*Erinna newcombi*), but none were observed. We observed a native damselfly, likely *Megalagrion vagabundum*, the Scarlet Kauaʻi Damselfly, near the North Fork diversion.

For introduced species, at all upper sites we observed Tahitian prawns (*Macrobrachium lar*), Bullfrog tadpoles (*Rana catesbeiana*), and guppies (*Poecilia reticulata)* in the diversion pool and in pools immediately below the diversion. We also observed Green Swordtail (*Xiphophorus hellerii)* and crayfish (*Procambarus clarkii*) in the diversion pool on Waikoko Stream.

We surveyed a small tributary of Iliʻiliʻula stream (I2T) to see if tributary streams held different species compositions. As with other upper sites, the most common species was ʻōpae kalaʻole with a few Tahitian prawn, crayfish and unidentified frog eggs. Additionally, we surveyed within the Iliʻiliʻula – North Wailua Ditch between the North Fork diversion and the Waikoko diversion as well as between the Waikoko diversion in the Iliʻiliʻula diversion. Within the ditch, ʻōpae kalaʻole were extremely numerous. We observed small and large size classes as well as gravid females suggesting that the ditches serve as suitable habitat for the native ʻōpae kalaʻole. It is also likely that ʻōpae kalaʻole are traveling among upper reaches of streams using the ditch system.

Upper Mid-reach Sites: The upper mid-reach sites were less steep and tended to be braided with extensive unconsolidated cobble and small boulder substrate. The sites were transitional locations between the steep upper reaches and the larger mid-reach sections of the streams. We surveyed sites fitting this category in the North Fork Wailua (sites NF3L, NF3R, NF3D, NF4Up, NF4T1 and NF4T2) and Waikoko (site W3) stream.

The water in the braided areas appeared to flow into and up from the substrate making some areas dry or only containing disconnected pools. Where the flow was on the surface, we observed a mix of riffles, runs and shallow pools. We observed seeps flowing into the streams in these areas. Overall, these segments of the streams appear to be a depositional zone where large amounts of upstream rocks are deposited during flood flows. The unconsolidated substrate allows the water to easily flow into, around or under it making the area appear to gain and lose stream flow as you move through it. No manmade barriers were present, however surface flows were greatly reduced in some reaches due to subsurface flows. Site NF3L and NF3R on the North Fork Wailua show the most areas with subsurface flow. The sites did not appear to be losing water to the groundwater, as stream volume became smaller and larger in close proximity. Where water flow exists the instream habitat is generally good. All these sites were downstream of the Iliʻiliʻula – North Wailua Ditch diversions and the streams appeared to have recovered enough water flow to have good instream habitat.

We observed primarily two species in these areas, the Tahitian prawn (*Macrobrachium lar*) and guppies (*Poecilia reticulata).* Surprisingly*,* no native species were observed in these sites. As noted, instream habitat appeared good with riffle, runs and pools present, containing a wide range of substrate. The presence of Tahitian prawn and guppies suggests that water quantity and quality were sufficient for the species and were also likely sufficient for native amphidromous stream animals. While it was possible Tahitian prawns were preying on the native stream animals, this is unlikely to be the only factor as Tahitian prawns co-occur with native amphidromous fishes elsewhere in the Wailua River system and statewide. We did not observe smallmouth bass (*Micropterus dolomieu)* in these areas and this was likely the result of the streams being too shallow for smallmouth bass to persist long-term. Stream pools rarely were greater than 3 feet deep and many pools were much shallower than that. This contrasts with areas in which smallmouth bass were common where pools were often 6 feet deep or greater.

Mid-reach Sites:

The mid-reach sites were characterized by large, deep pools and wide runs and were located upstream of the large waterfalls. Wailua River is one of the largest rivers by volume on Kauaʻi, and at these sites the stream is much larger than the upper or upper-mid sites. The surveyed sites that fall into this category are NF4D, NF5, NF6, NF7Up, NF7D and NF8 on the North Fork and SF1, SF2, SF3 and SF4 on the South Fork. At these sites, pools are typically deep, and on average about 20 to 40% of the surveyed segment was greater than 3 ft deep. We observed smaller substrate in these pools than at upstream sites and sand and gravel began to appear, although boulder and cobble substrate continued to be common. Run and riffles were common and were typically 6 to 24 inches deep. Water clarity decreased slightly as the water became greener than the very clear water in the upstream sites.

We commonly observed smallmouth bass (Figure 111), Tahitian prawns (Figure 112) and guppies in the stream segments. The smallmouth bass were observed in all size classes from young of the year (approximately 2 inches in length) to large adults (greater than 18 inches long). It was not uncommon to see numerous smallmouth bass in a single stream pool. The smallmouth bass appeared curious as they would swim around us while we were surveying. We observed more and larger smallmouth bass in the South Fork as compared to the North Fork of the Wailua River. This may be due to the fact that the sites we surveyed on the South Fork were on private property, while sites NF4 to NF6 were on public property (state conservation land). Fishing pressure may decrease the size and number of smallmouth bass on public lands. The Tahitian prawns we observed in the sites were typically large and were observed under boulders or other cover which may be due to predation by smallmouth bass. The guppies we observed were almost always in extremely shallow water at the edges of pools.

No native amphidromous stream species were observed. Their absence is unlikely to be the result of poor habitat conditions. Extensive suitable habitat in terms of habitat type, depth, velocity and substrate were observed at all sites. Smallmouth bass are a long-lived, riverine species (Edwards et al. 1983) and their continued presence suggested that water quantity and quality likely were suitable for native stream species. It is likely smallmouth bass are preying on native amphidromous stream species and limiting the suitability of this mid-reach habitat for the native species.

The sites were also located above the large Wailua Falls on the South Fork and Kaholalele Falls on the North Fork. It is likely these waterfalls were also restricting the upstream movement of the native amphidromous stream species. It is well known that the Wailua Falls on the South Fork is a large, undercut waterfall and undercut waterfalls limit upstream passage of native amphidromous fishes. We were not able to view Kaholalele Falls on the North Fork to see if was also undercut, but it is possible that it, too, has a limited suitable climbing pathway for native amphidromous fishes. The lack of native fish above the falls may be the result of passage barriers at the waterfalls and predation by smallmouth bass.

Low Reach Sites: The lower reach sites were located below the large Wailua Falls on the South Fork (SF5) and the Kaholalele Falls on the North Fork (NF9). The Wailua River was wide and deep at its mouth and we surveyed the last riffles prior to entering the deep-water, terminal section of the river. These sites had a wide size range of substrates, but cobble and small boulders were still common. We did not complete extensive habitat or fish surveys in these areas. Our intent was to see if native species existed in the North or South Forks as we had not observed any native amphidromous animals except for ʻōpae kalaʻole in the upper reaches.

We observed numerous native species below these waterfalls (Figure 113). Native amphidromous stream fishes, ʻoʻopu nakea (*Awaous stamenius*), oʻopu naniha (*Stenogobius hawaiiensis*), and ʻoʻopu akupa (*Eleotris sandvicensis*) were observed at both locations. We also observed Aholehole (*Kuhlia xenura*) at both sites. At the South Fork location, we observed post-larval o'opu alamoʻo (*Lentipes concolor*) and o'opu naniha (*Stenogobius hawaiiensis*) migrating upstream. The presence of post-larval ʻoʻopu alamoʻo was interesting as this is a climbing species that we would have expected to be observed upstream of the large waterfalls. The presence of post-larval ʻoʻopu alamoʻo below the waterfalls confirms that they were in the Wailua River system and highlights the issues with passage over Wailua Falls and predation by smallmouth bass. Suitable instream habitat appeared to exist above the falls but was not occupied by native amphidromous fishes.

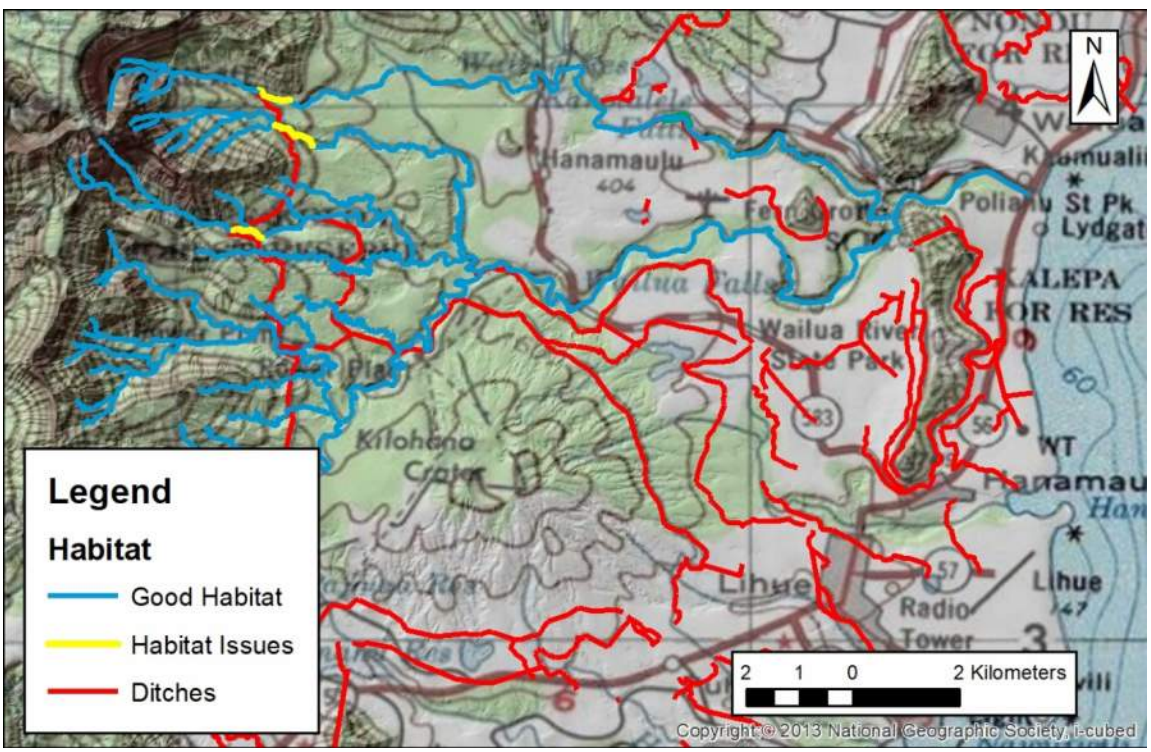


Figure 109: Generalized map poor quality habitat in the Wailua River System.

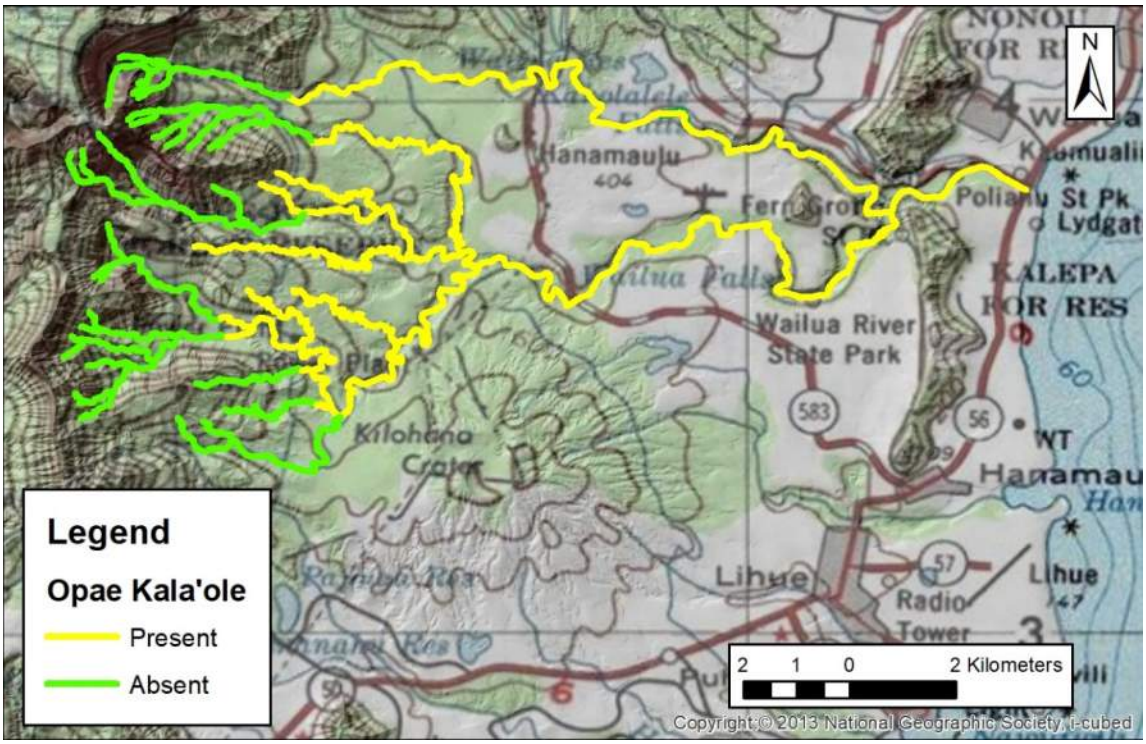


Figure 110: Generalized map of likely ʻōpae kala'ole distribution in the Wailua River.

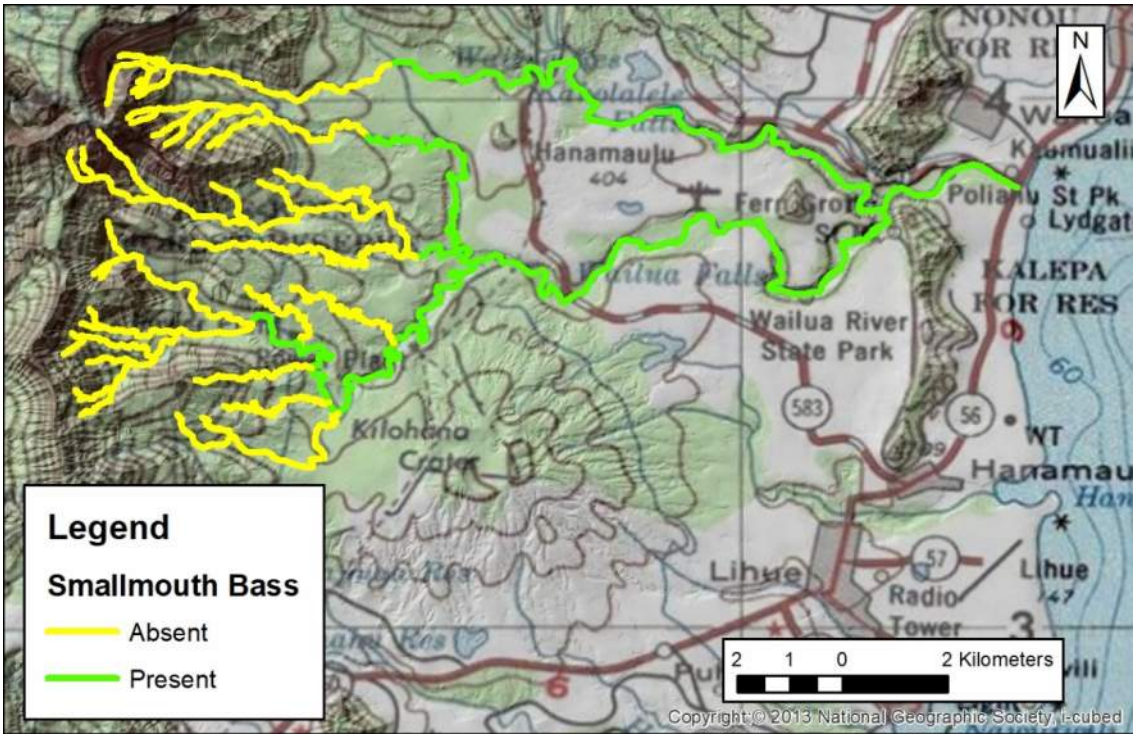


Figure 111: Generalized map of likely smallmouth bass distribution in the Wailua River.

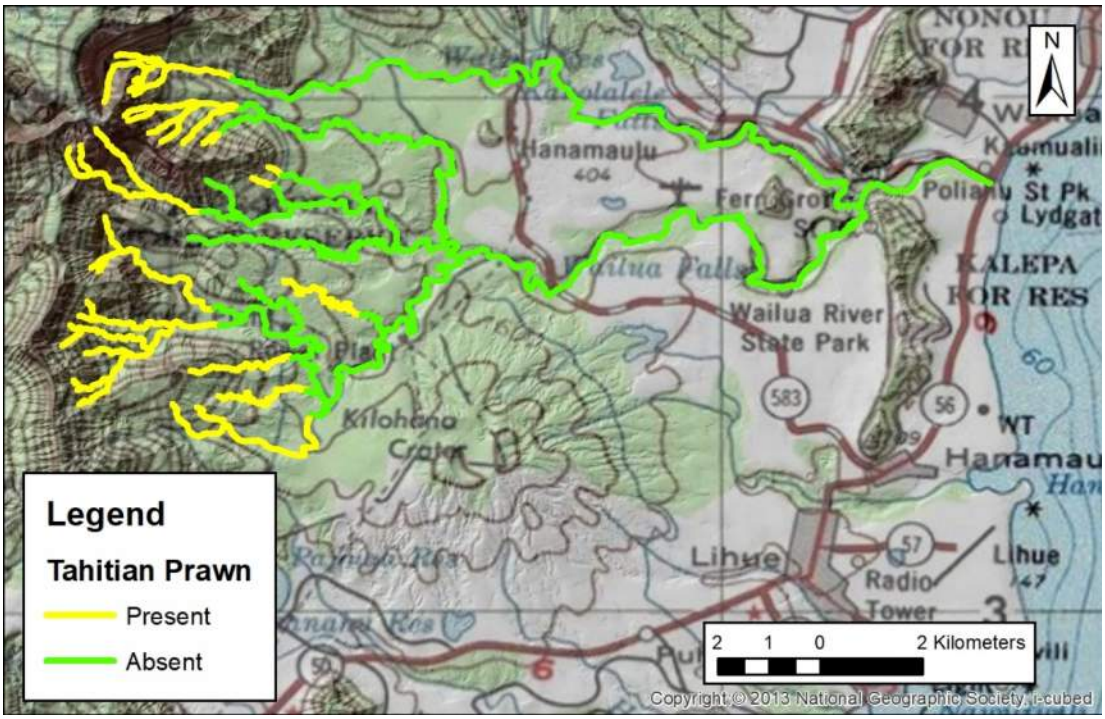


Figure 112: Generalized map of likely Tahitian prawn distribution in the Wailua River.

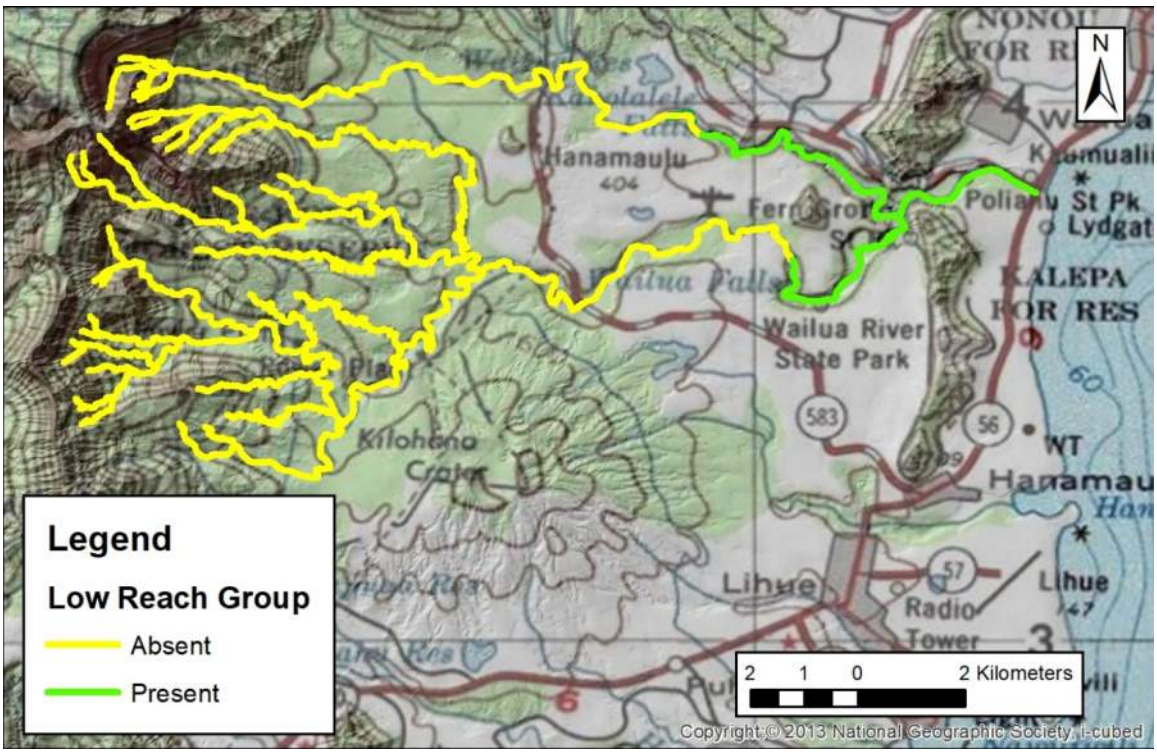


Figure 113: Generalized map of likely non-climbing, lower reach native species distribution in the Wailua River.

Results: Seepage Run

North Fork of the Wailua River:

The seepage run on the North Fork of the Wailua River was focused on the segment of the stream from the North Fork Diversion downstream to the confluence of the North Fork with the East Branch of the North Fork of the Wailua River (Figure 114). Figure 115 shows a schematic representation of the survey sites.

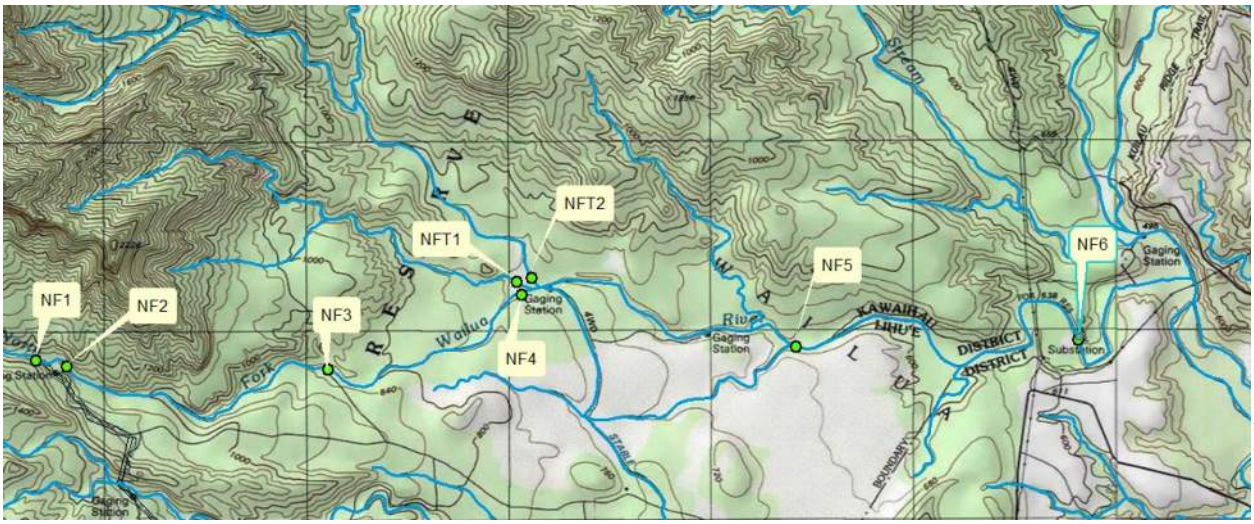


Figure 114: Map of general discharge measurement locations for the North Fork of the Wailua River seepage runs.

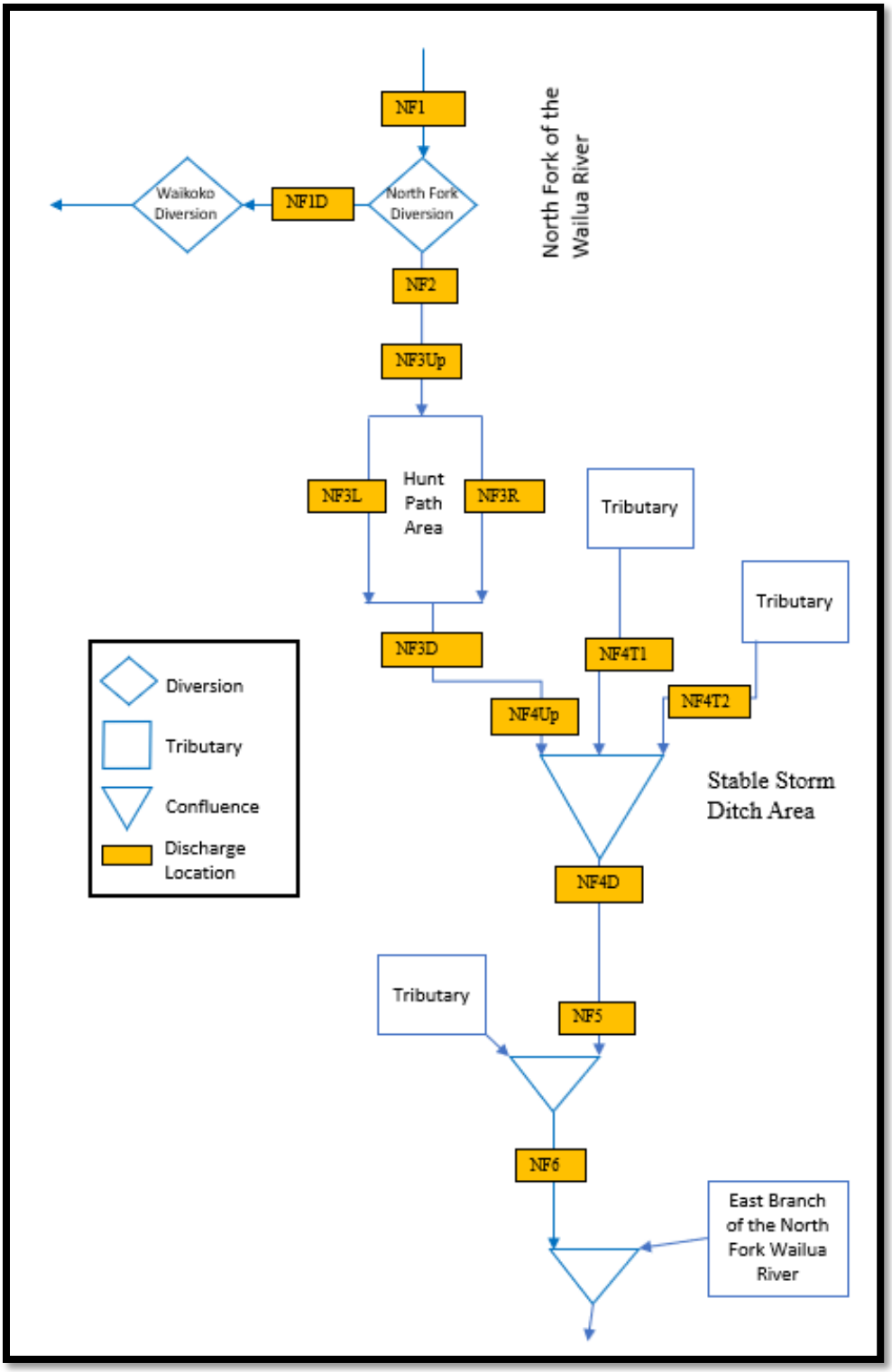


Figure 115: Schematic of seepage run measurement locations for North Fork of the Wailua River.

North Fork Diversion Area (NF1, NF1D & NF2)

We measured discharge at two locations in the North Fork Diversion Area, the ditch section between North Fork Diversion and Waikoko (NF1D) and North Fork Wailua River downstream of North Fork Diversion (NF2) (Figure 116). Measurements within the ditch (NF1D) are captured approximately every hour by a gage installed in the ditch. The field measurement was taken within the ditch approximately 50 ft downstream of the diversion. The measurement location of water passing the diversion and flowing downstream (NF2) was located on the spillway. The discharge estimates for the amount of water flowing above the diversion (NF1) was calculated as the sum of the water flowing into the diversion (NF1D) and flowing downstream past the diversion (NF2).

Figure 116: North Fork Diversion Area flow measurement locations on June 12, 2018. Ditch segment between North Fork Diversion and Waikoko (NF1D), North Fork Wailua River downstream of North Fork Diversion (NF2).

Hunt Path Area (NF3Up, NF3L, NF3R, NF3D)

The North Fork Wailua at the Hunt Path Area (NF3) sampling location was in a braided section of the stream. The stream in this area appeared to flow down into and back up out of the cobble and small boulder substrate. Sampling locations were places in four different areas. One site was above the braided section (NF3Up), two sites were in the braided sections with one on the left

stream braid (NF3L) and one on the right stream braid (NF3R) and the other site was below the braided section (NF3D) (Figure 117).

Figure 117: Flow measurement locations for the Hunt Path Area on the NF Wailua. Upper Hunt Path (NF3Up), Hunt Path Left (NF3L), Hunt Path Right (NF3R), Lower Hunt Path (NF3D).

Stable Storm Area (NF4Up, NF4T1, NF4T2, NF4D)

The Stable Storm Ditch Sampling Area consisted of the North Fork Wailua River upstream of the Stable Storm Ditch (NF4Up), the incoming Tributary 1 (NF4T1) and Tributary 2 (NFT2), and the stream below the confluence of the North Fork Wailua and the two tributaries (NF4D). Each of the sampling transect locations was just upstream of the confluence in run/riffle habitat with a mix of cobble and boulder substrate (Figure 118). Tributary 1 was marked as intermittent on the USGS topographic map and Tributary 2 as marked as a perennial stream. Discharge at the downstream site (NF4D) was calculated as the sum of the three upstream inputs.

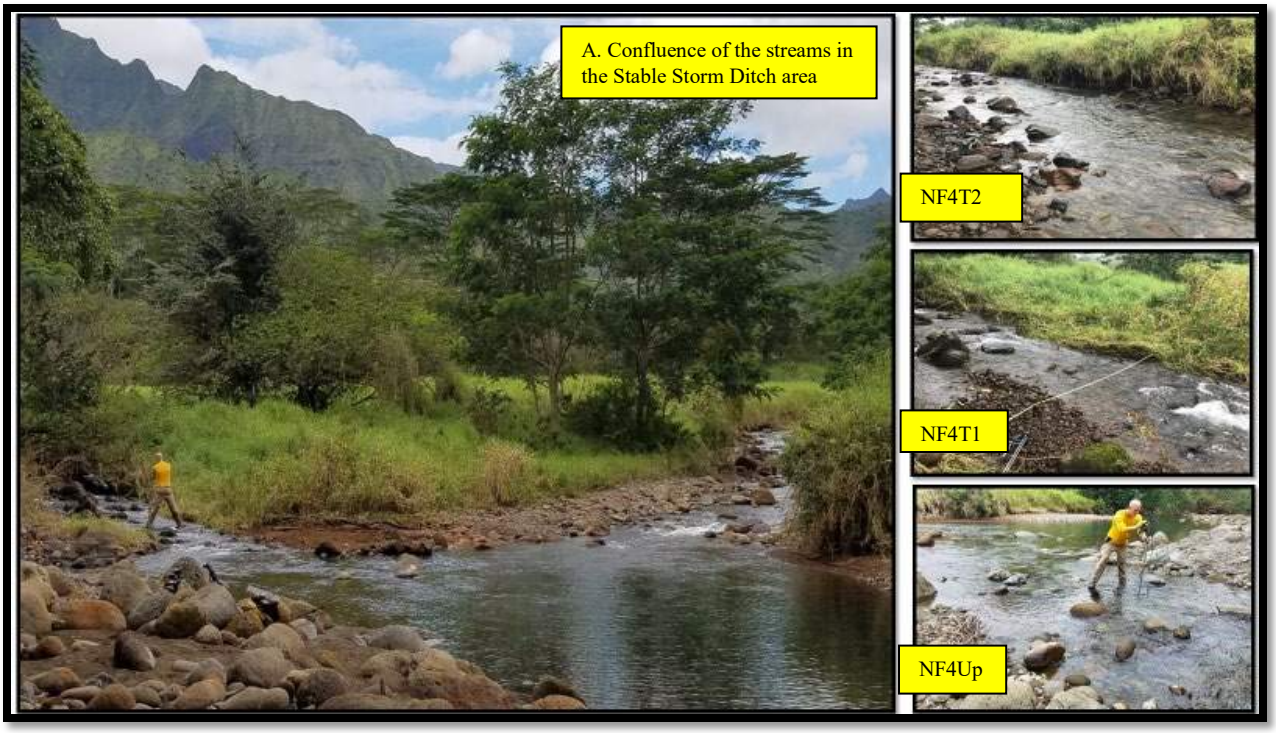


Figure 118: Stable Storm Area (A) of the North Fork of the Wailua River upstream of Stable Storm Ditch (NF4Up), Tributary 1 at Stable Storm Ditch (NF4T1), Tributary 2 at Stable Storm Ditch (NF4T2). The NF4D would be downstream and equal the sum of the three upstream channels.

Muddy Tributary Area (NF5)

The NF5 flow measurement location was approximately 100 feet upstream of a muddy tributary which flowed into the North Fork of the Wailua River. This site was not far downstream of the old USGS gage site in this area. The transect was located in a run with primarily cobble substrate (Figure 119). We were not able to measure the discharge of the muddy tributary as it flowed out of a tangled growth of hau bush and spread out across shallow cobble before intermixing with the main river channel. From a visual observation, the discharge was likely less than 1 cfs during our surveys. We were unable to determine the source of the sediment in the tributary.

Figure 119: Stream flow measurement location for NF Wailua River at Muddy Water (NF5) and the Muddy Tributary (A)

Lower North Fork Road Crossing (NF6)

The NF6 sampling location was downstream of the low water bridge road crossing on the North Fork of the Wailua River. The site was upstream of the confluence with the East Fork of the Wailua River. This location was the downstream most sampling location for the seepage run study. The site was located in a run with a mix of cobble and boulder substrate (Figure 120).

Figure 120: Stream flow measurement location for North Fork of the Wailua River downstream of the road crossing (NF6).

For the results of the seepage run on February 11, 2018, the North Fork diversion was removing 92.6% of the flow at the diversion site (Figure 121). We recorded 2.01 cfs flowing past the diversion. At the next downstream sampling location just above the Stable Storm ditch area, we observed a gain of 1.75 cfs of water. At this location two tributary streams join the NF Wailua River and increased combined stream discharge to 22.84 cfs. From this location down to our lowermost sampling site we saw consistent gain in stream discharge with a total of 31.05 cfs recorded at the lowest site. Below the confluence of the NF Wailua River and the two tributary streams in the stable storm ditch area, instream habitat was excellent with no shortage of deep pools, swift runs and riffles.

For the seepage run on February 12, 2018, the North Fork diversion was removing 97.3% of the flow at the diversion site (Figure 122). Only 0.55 cfs of water was passing the diversion and as a result instream habitat immediately below the diversion was poor with extensive areas of dry streambed. During the seepage run, we sampled an intermediate location between the diversion and the Stable Storm ditch area by hiking in on the hunter's path. We observed a gain in stream discharge of 2.55 cfs between the North Fork diversion and the Hunt Path sampling area. In contrast to the day before, we observed a slight loss (-0.46 cfs) in stream discharge between the Hunt Path and the Stable Storm ditch area. From the Stable Storm ditch downstream to the lowest sampling location we again observed a gaining stream with excellent instream habitat.

As a result of the slight losing segment between the Hunt Path and the Stable Storm ditch area, we returned and resampled this area on June 12, 2018. The focus here was only the NF Wailua between the North Fork diversion and the Stable Storm ditch area (Figure 123). We included sample sites above the braided section, within the braided section, and below the braided section in the Hunt Path area. The North Fork diversion was returning 100% of the water back to the stream channel through the sluice gate. The 100% water return was further confirmed by KIUC measurement gage weir on the ditch downstream of the sluice return recording 0 cfs of water for all of June 12, 2018. We measured 6.23 cfs was passing the diversion and flowing downstream and 26.43 cfs was returned at the sluice gate. Thus, a total of 32.66 cfs flowed downstream after the confluence of the stream channel and the sluice water return. At the start of the Hunt Path area above the braided section we recorded 32.55 cfs, a loss of 0.11 cfs. In contrast to the February survey, we observed a slight loss of streamflow between the North Fork diversion and the Stable Storm Ditch area. Within the braided section, we observed streamflow flowing into and out of the unconsolidated bottom substrate. At our transect locations within the braids and below the braided section, we observed a loss of stream flow. We saw flow recovery between the Hunt Path area and the Stable Storm ditch area. Much of the variability in discharge between measurement locations may be due to the complex flow patterns around and through the unconsolidated boulder and cobble substrate. Overall, the Hunt Path area appears to have substantial hyporheic flow but does not appear to be substantially losing water to the ground.

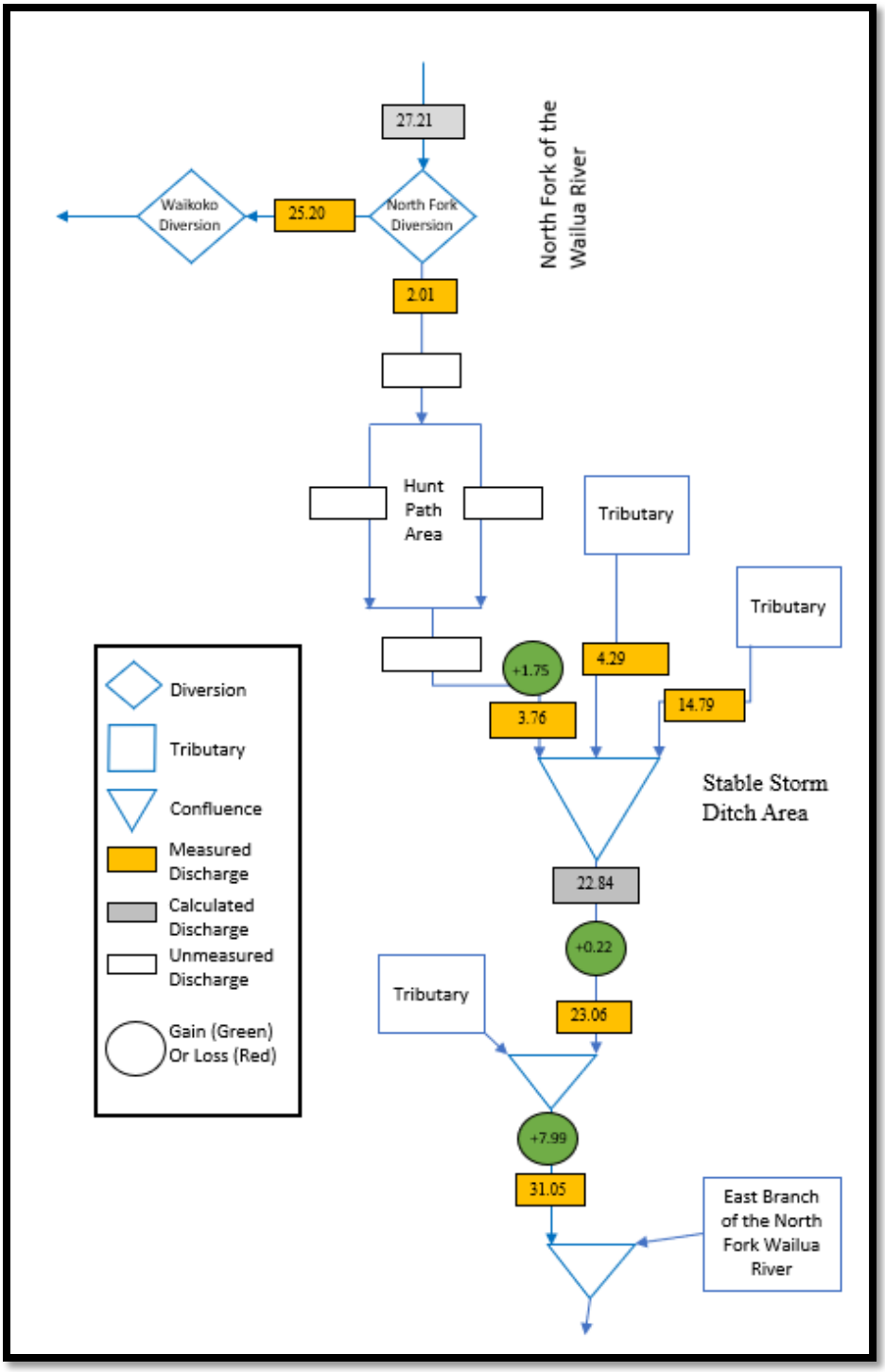


Figure 121: Flow schematic and site measurements for Nork Fork of the Wailua River seepage run on February 11, 2018.

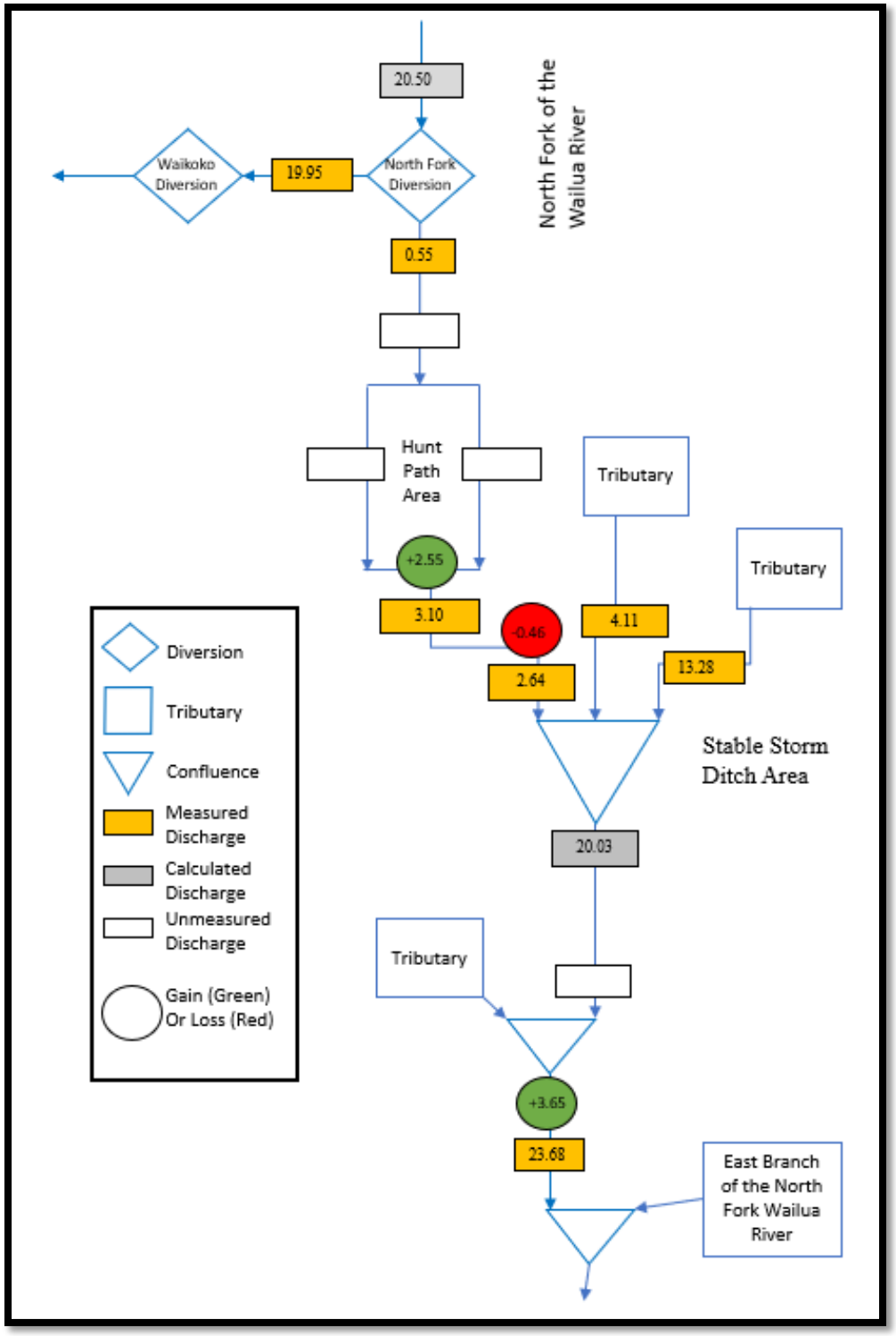


Figure 122: Flow schematic and site measurements for North Fork of the Wailua River seepage run on February 12, 2018.

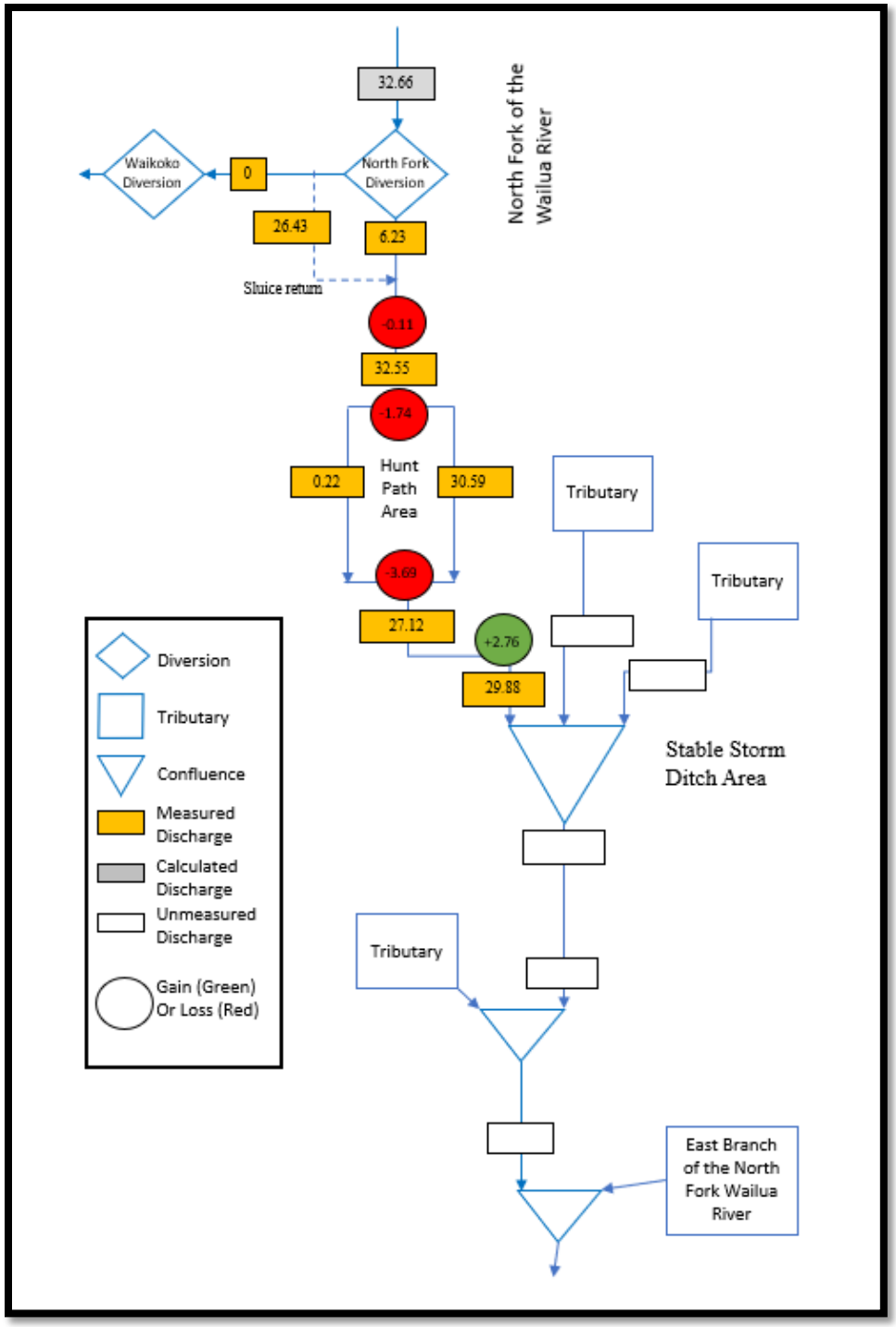


Figure 123: Flow schematic and site measurements for North Fork of the Wailua River seepage run on June 12, 2018.

Seepage Run – Waikoko Stream

The seepage run on the Waikoko Stream, tributary to the South Fork of the Wailua River, was focused on the segment of the stream from the Waikoko Diversion downstream to the confluence of the Stable Storm Ditch (Figure 124). Figure 125 shows a schematic representation of the survey sites.

We gathered stream discharge information for two different seepage runs on February 13, 2018 and June 19, 2018. We also gathered a smaller subset stream discharge on February 14, 2018. For the seepage run, we collected the discharge at each site as quickly as possible to minimize changes occurring during the day. The upper two sites were located above the diversion and were in the two upper forks of Waikoko Stream (W1L and W1R) (Figure 126). Discharge measurements within the ditch (W1D and NF1D) were captured approximately every hour by gages installed in the ditch. Fundamentally, the upstream and in-ditch discharge measurement did not contribute to the seepage run results as the focus of the seepage run was on the stream segment downstream from the diversion. The upstream and in-ditch measurement are shown for reference purposes. Downstream of the Waikoko diversion, the transect was located below the diversion outfall and the ditch outfall that allowed water to return to the stream (Figure 127). Thus, it captured any water returned to Waikoko Stream from the diversion structure. The mid-reach site on Waikoko stream (W3) was located at a trail stream crossing (Figure 128). Sites W4 to W6 were all in the lower reach prior to it joining with Stable Storm Ditch (Figure 129 and Figure 131). In between sites W4 and W5 a small tributary entered the stream. We were not able to measure flow in this tributary as it entered the stream as a waterfall, but we were able to get a picture of the stream where it crossed the trail to sites W3 (Figure 130). Another tributary (W5T1) entered Waikoko stream between sites W5 and W6 (Figure 132).

The results of the seepage run for each day can be seen in Figure 133, Figure 134 and Figure 135 for February 13, 14 and June 19, 2018 respectively. On February 13, we observed gaining discharge from the diversion (W2) downstream to the lowermost transect (W6) (Figure 133). Much of the gain in discharge could be accounted for as flow coming in from tributary streams, but a small additional input from groundwater recharge was likely. On this day 61% of the flow coming in from above the diversion (4.24 cfs) was flowing downstream past the diversion (2.6 cfs). Instream conditions appeared good at all sites. Total stream flow at the downstream end of the segment was 8.21 cfs.

On February 14, 2018, we only collected stream discharge at mid-reach site W3 and low reach site W6. Stream discharge gained 2 cfs between these two sites and as we observed on February 13, tributary input likely accounted for most of this increase (Figure 134). Total stream flow at the downstream end of the segment was 8.11 cfs which was only slightly less than on February 13.

On June 19, 2018, we observed slight loss (-0.08 cfs) between discharge measurements below the diversion at site W2 and the mid-reach site W3 (Figure 135). This may be within the range of

measurement error given the boulder-filled stream or the water may be flowing through the substrate as it passes downstream. From the mid-reach site W3 to the low-end site at W6 we recorded an increase of 4.38 cfs. Again, this may be due to tributary input, but also likely had some groundwater recharge. Total streamflow at the downstream end of the segment was 10.13 cfs which was greater than on February 13 or 14, 2018.

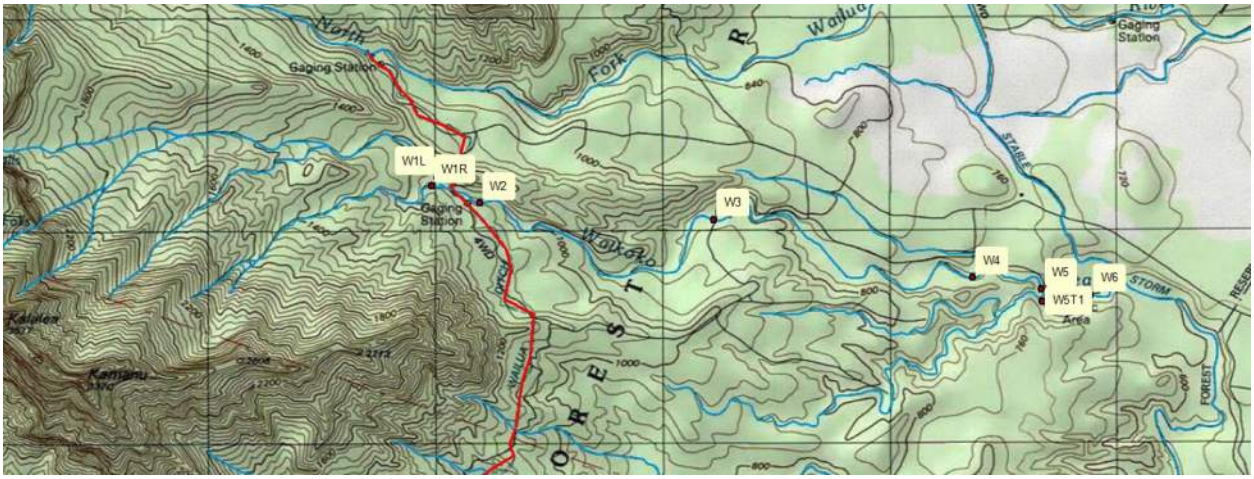


Figure 124: Map of site for the Waikoko seepage run.

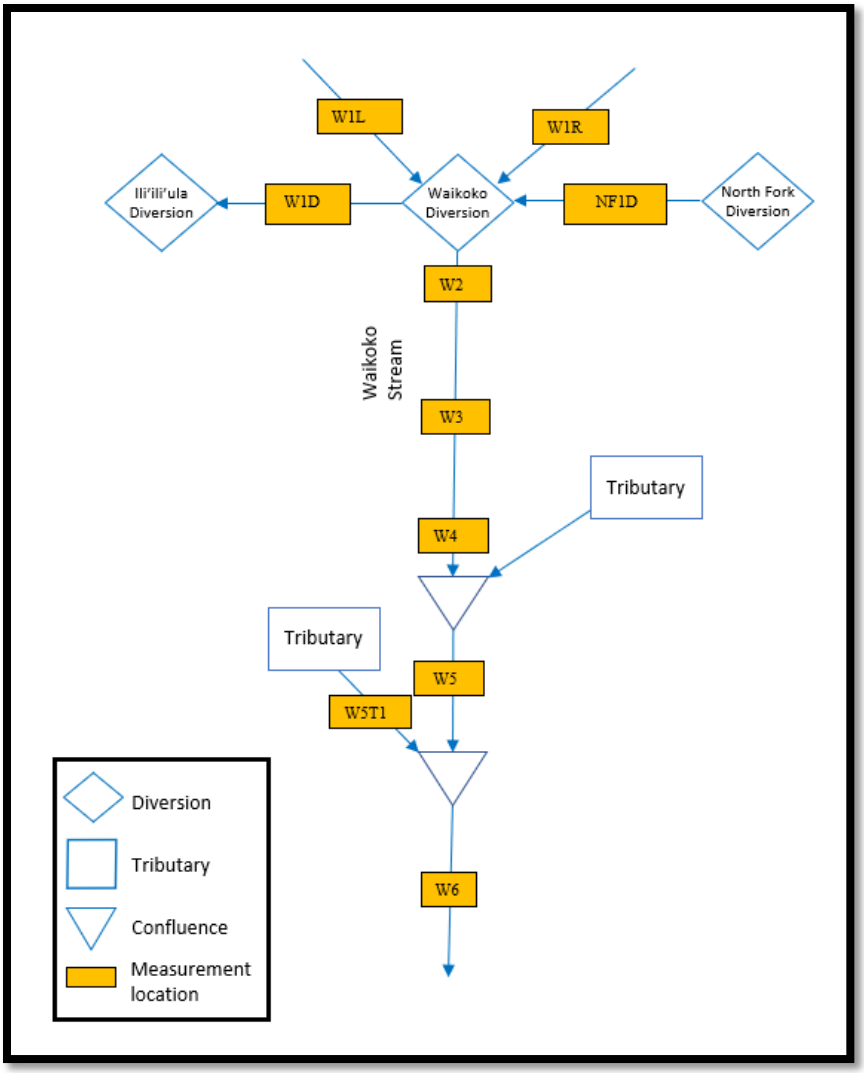


Figure 125: Schematic for the Waikoko Seepage run.

Figure 126: Waikoko Stream and Diversion area. Note the two forks (W1L and W1R) flowing into diversions area.

Figure 127: Transect location below Waikoko Diversion (W2).

Figure 128: Transect location in Waikoko Stream (W3).

Figure 129: Transect location in Waikoko Stream (W4).

Figure 130: Small tributary stream to flowed into Waikoko Stream between W3 and W4.

Figure 131: Transect location in Waikoko Stream (W5).

Figure 132: Tributary flowing into Waikoko Stream (W5T1).

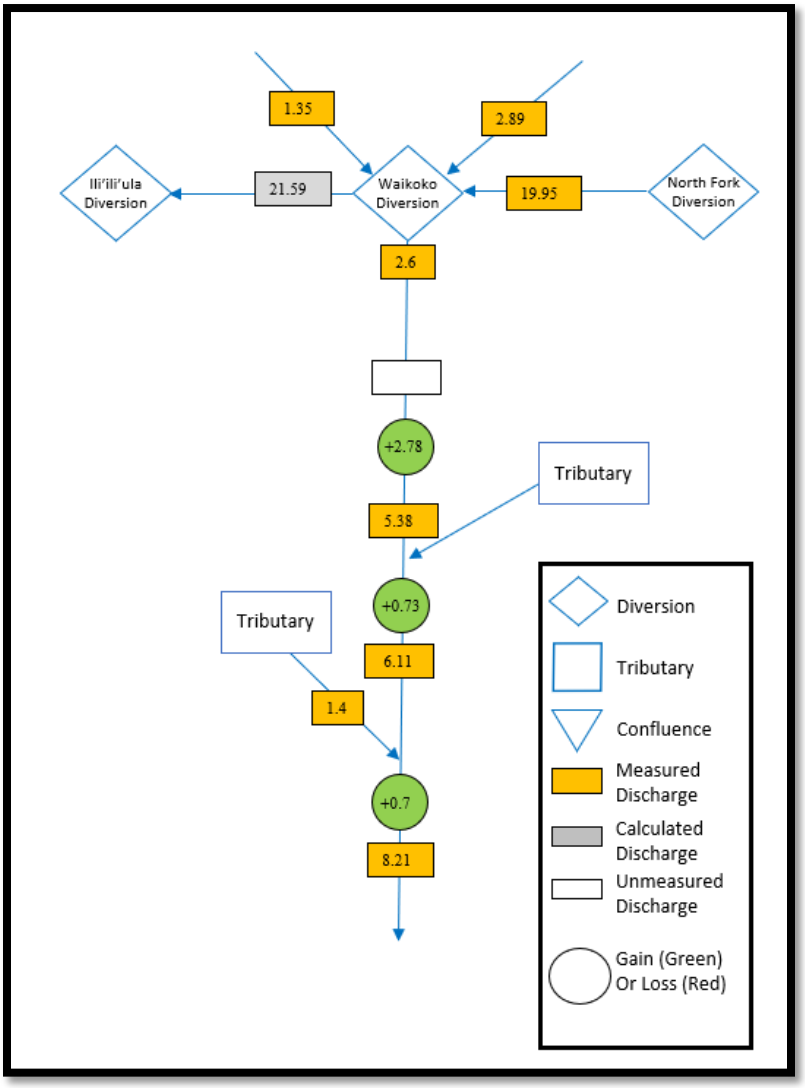


Figure 133: Seepage Run results for Waikoko Stream on February 13, 2018.

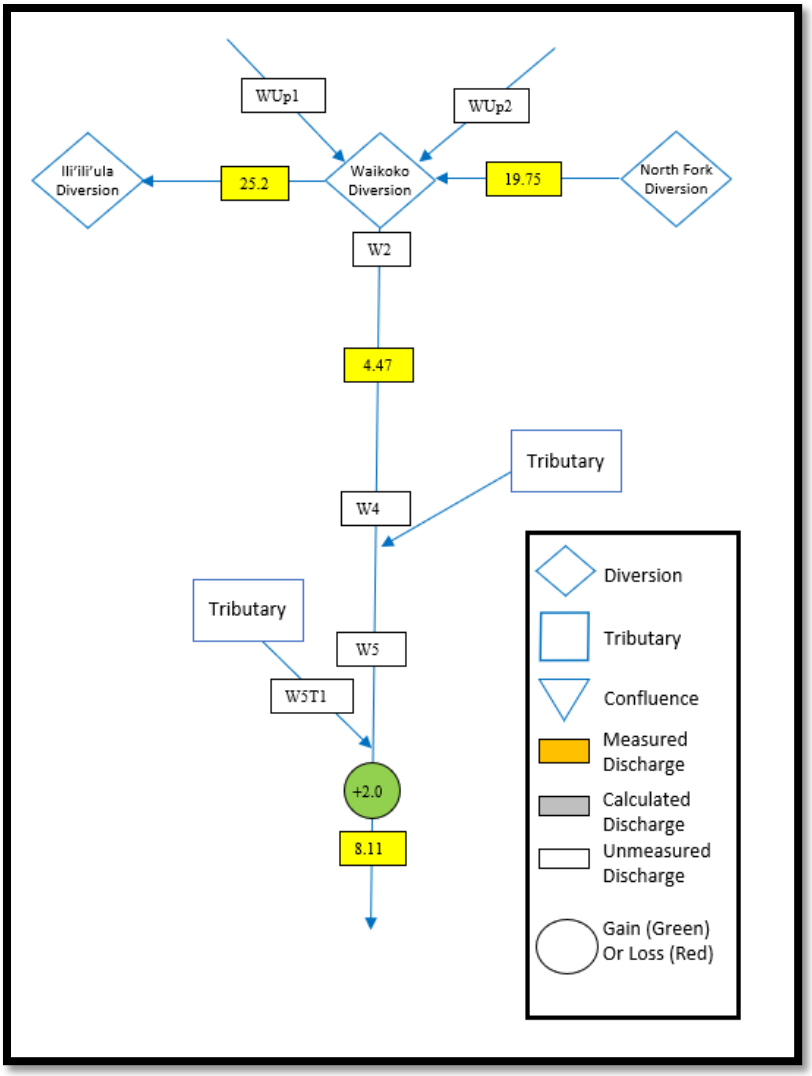


Figure 134: Seepage Run results for Waikoko Stream on February 14, 2018.

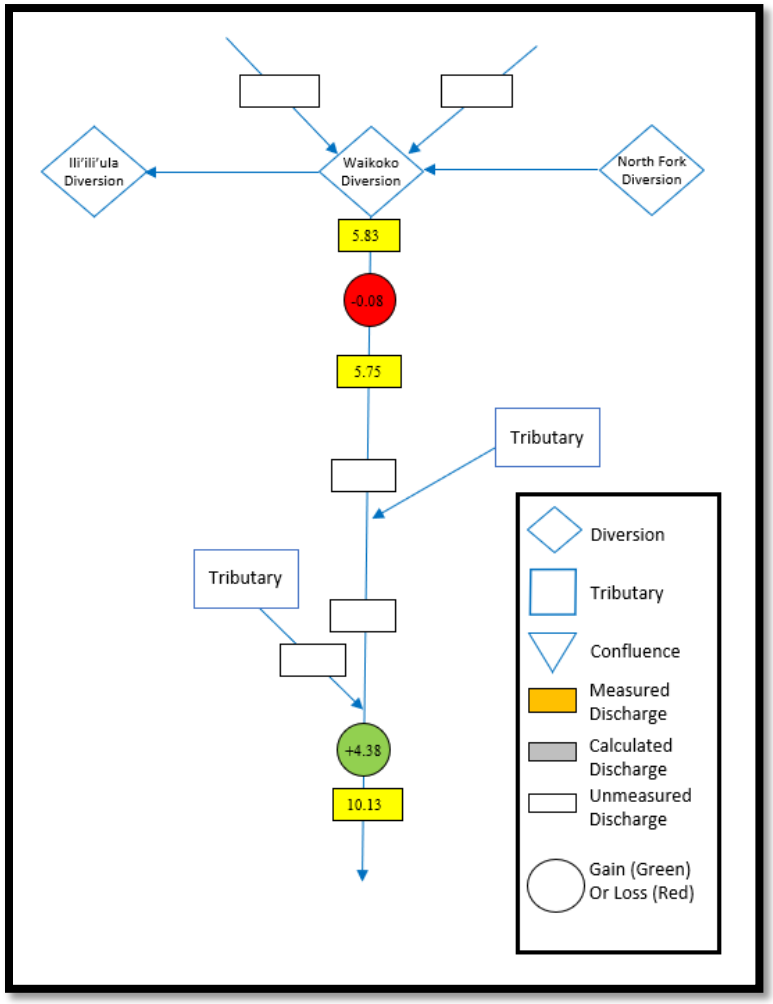


Figure 135: Seepage Run results for Waikoko Stream on June 19, 2018.

Conclusions: Seepage Run

The results for the seepage run for both the North Fork of the Wailua River and Waikoko Stream showed a similar pattern. Both stream segments appeared to be gaining water as they flowed from the diversion locations downstream. There was extensive tributary inflow into these stream segments and likely subsurface flow and forms of springs or seeps. During our habitat surveys we observed seeps flowing into the streams in both segments. The finding that the streams are gaining under most conditions is important as it is likely that any water restored to the stream at the diversion locations will flow down the stream channel and not be lost to the underlying groundwater system. The North Fork of the Wailua River is a much larger stream than Waikoko

stream and we observed more variability in flow over time and in between segments. Two features of the streams were apparent during the surveys that mark further discussion; hyporheic flow and the impact of flood flows on channel stability.

Hyporheic flow:

Hyporheic flow is defined as streamflow that enters the hyporheic zone (the pore space between rocks in the bed of the stream) and reenters the streamflow further downstream. It is not gaining or losing water from or to the groundwater but flowing through the substrate of the stream. Some short-term hyporheic flow in and among the boulders and large cobble in Hawaiian streams is extremely common, but in long segments of the North Fork of the Wailua River and Waikoko stream we observed streamflow decreased markedly and then reappeared several hundred meters downstream only to disappear again and reappear repeatedly. The areas that were dominated by hyporheic interaction appeared to be a transition zone from the steep upper reaches to the more gently sloped middle reaches of the streams (Figure 136). In this transition zone alluvial fan was created during high flow events. The constrained channel in the upper reach transports cobble and boulder downstream at high flows and then in these areas the cobble and boulder are deposited in the channel and the channel braids in response. Thus, these unstable channels filled with unconsolidated rock allow the water to flow freely through the substrate and back to the surface in an ever-changing pattern controlled by past flow events.

Impact of the flood flows on channel stability:

A second feature of the streams which is closely tied to the observed hyporheic flow is the obvious impact that flood flows have on overall channel stability. We observed extensive areas of streambank erosion and active substrate movement. Prior to the February and June surveys there were large flood flows observed in the systems. As a result, stream channels were shifting position and the substrate was freshly deposited in the stream. The record flood that occurred on April 15, 2018 impacted the stream channels in the Wailua River system. We observed large trees that had been washed away between the two survey events (Figure 137 and Figure 138) and the braided channels in the North Fork above the Stable Storm Ditch confluence area had clearly changed position. There were large numbers of hau bush, bamboo and albizia trees present in the North Fork River channel during the June survey that had fallen into and along the streams during the April flood event. As a result of these prior flood flows, we saw very little substrate embeddedness and pools, riffles and runs were well-defined and contained clean substrate. Overall, the habitat conditions looked excellent throughout most of the streams due to the flushing flows that had occurred multiple times through the first half of 2018.

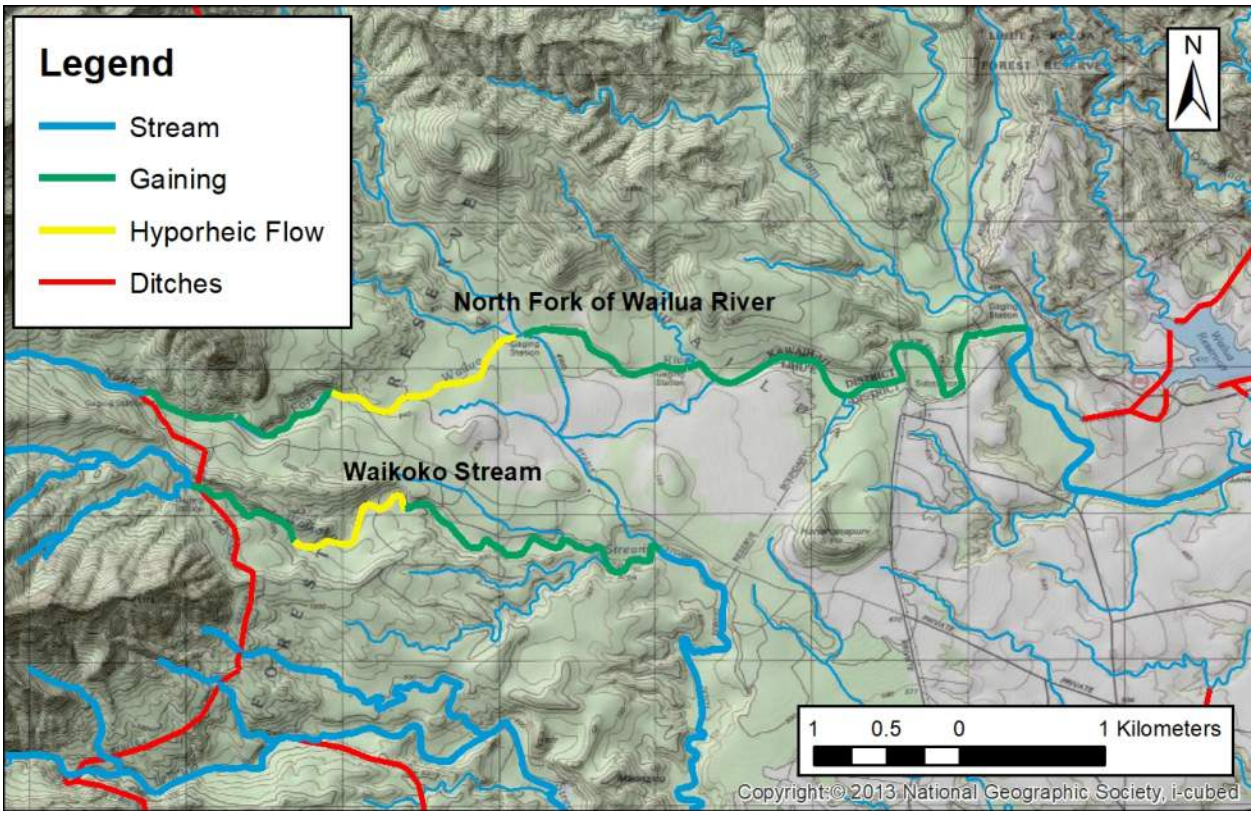


Figure 136: Conceptual map of the areas of the North Fork and Waikoko Streams that shows that the streams are gaining streams in general with areas of substantial hyporheic flow.

Figure 137: Image taken on Feb 11, 2018 of the confluence area at the Stable Storm Ditch sample area on the North Fork of the Wailua River. The circled trees were not present in the June survey at this location.

Figure 138: Image taken on June 12, 2018 of the confluence area at the Stable Storm Ditch sample area on the North Fork of the Wailua River. Notice that the tall trees to the right have been washed away and a shift in channel position has occurred on the right tributary.

HSHEP Results

A rainfall-runoff relationship was created to provide a comparative estimate of discharge for each basin and allow for an accumulation of impacts and an estimate of stream size to be included in the HSHEP model (Table 26). We compared the total annual rainfall (Giambelluca et al. 2013) in the basins upstream of the gage location with the Q_{80} discharge statistic (CWRM 2018) for the gage. The Q_{80} discharge statistic was used as a surrogate for normal low flow conditions. The linear relationship is a strong fit to the data ($r^2 = 0.85$) (Table 27). It is not surprising that there is some difference in the values, as the modeled basin discharge was based on the assumption that all streamflow was directly related to rainfall in that there were no gaining or losing sections within the watershed or that the gages had no influences of flow modification. Although there are gaining and losing sections within the watershed, this approach provided a consistent comparative estimate of stream size.

The rainfall-runoff relationship has several advantages over the prior 2014 HSHEP modeling effort completed on the Upper and Lower Waiahi Hydropower system. Explicitly estimating discharge allowed for the impacts resulting from diverted flow to be accumulated in all downstream segments. For example, if a diversion removed 1 cfs of water, that 1 cfs of water would be lost from all downstream stream segments and thus the impact of that lost water on habitat can be calculated as the change in diverted baseflow versus natural baseflow. The explicit estimation of discharge also allows for the attenuation of impacts as flow from other sources downstream of the diversion re-water the stream channel. Finally, the discharge estimate can be used as a surrogate of stream size. Small streams carry a small amount of water and large streams carry a large amount of water and this has a direct relationship on the amount of instream habitat.

Table 26: Discharge (Q_{80}) for gages within the Wailua River Watershed (adapted from Tables 3-4 and 3-5 in CWRM 2018).

Station ID	Station Name	Discharge (Q_{80}) cfs
16068000	EB NF Wailua River	18
16071500	LB Opaekaa Stream	0.74
16063000	NF Wailua River near 650ft	29
220346159280601	WB NF Wailua River	16.8
220326159275401 & 220325159275401 combined	Waikoko	3.2

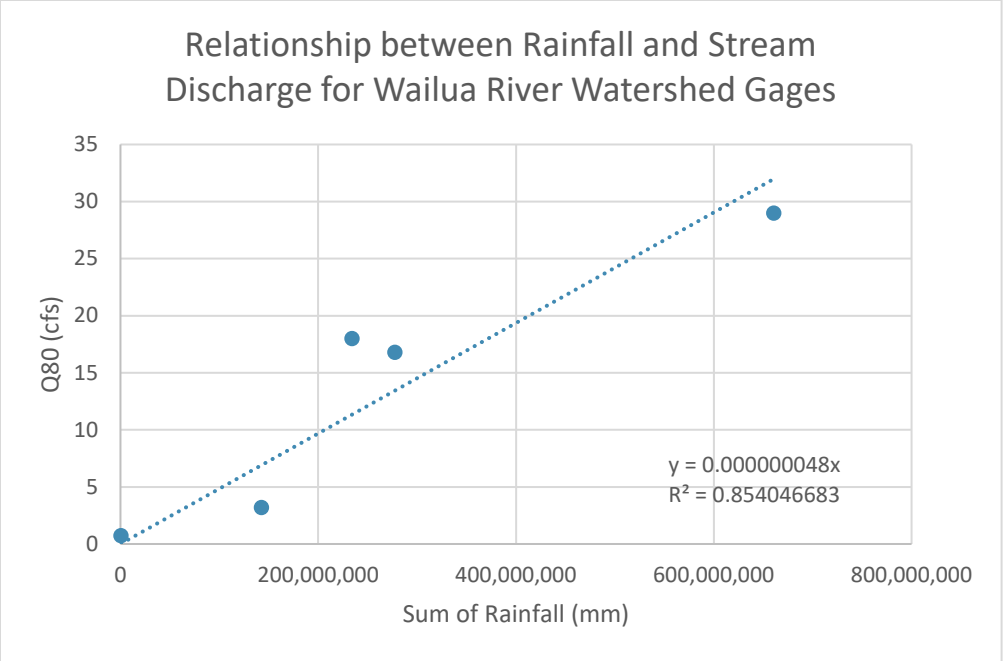


Table 27: Relationship between rainfall and stream discharge for the Wailua River system.

The goal of the HSHEP modeling was to compare the current flow conditions and the CWRM staff recommended IIFS flow restoration conditions with the suitable habitat under undiverted stream conditions. To accomplish this, we first needed to determine the natural or undiverted flow conditions and the extent of habitat for native stream animals as an upper boundary of habitat units available to compare to other scenarios. Additionally, the full-diversion scenario, which represents the diversions as they were designed and operated during agricultural production and hydropower generation, provided a lower boundary of habitat units or the maximum impact scenario for comparison.

In all scenarios where interbasin transfer of water occurred, the transfer of water did not add to the estimates of naturally available habitat units if the water transfer resulted in greater than 100% natural low flow. The HSHEP model specifically addresses the average low flow conditions. It does not account for periods of higher flow, nor averages habitat units available at higher flow with those calculated at normal low flows. The assumption within the HSHEP model design is the long-term animal population will be controlled by amount of habitat available during normal low flow conditions. Baseflow, the portion of the streamflow between precipitation events, or a specific discharge metric, Q_{80} for example, are examples of ways to determine a comparative low flow amount at different locations.

The full diversion and current condition scenarios were completed to add a better understanding of the impact of the diverted volumes in the upper Wailua River system. Scenario 3- IIFS Flow Restoration is the scenario that most closely represents the project impacts. In all scenarios, the

large waterfalls (Wailua Falls on the South Fork and Kaholalele Falls on the North Fork) had a passage impact set to 0.4 or 40% of climbing animals can pass, and the smallmouth bass predation impact was set to 0.8 or 20% of animals get eaten in each segment as they pass upstream. The major diversions downstream of the hydropower system (Upper Līhuʻe and Hanamāʻulu Diversions on the South Fork and Wailua Reservoir Diversion on the North Fork) are not controlled by the hydropower system and therefore are included in each scenario. In the No Diversion scenario, the impact area decreased to account for the additional undiverted water available without the hydropower diversions. In all other scenarios, these diversions were set to remove all of the Q_{80} discharge.

The values used for the four scenarios in the model are shown in Table 28 and were as follows:

1. No Diversion: This was the upper boundary comparison scenario in which all diversions were modeled as closed with no water diversion and no impact on passage or entrainment of animals. This scenario was the maximum available habitat units predicted.
2. Full Diversion: This was the lower boundary comparison scenario where all diversions in this scenario were modeled as fully open or diverting 100% of available low flows. The low flows, roughly analogous to the stream's baseflow, are critical to protecting instream habitat for stream species. The diversions and aqueduct system were built to capture 100% of normal low flow plus some smaller amount of storm runoff. Hawaiian streams are "flashy" where discharge rises quickly in response to rainfall and then quickly falls back to low flow conditions. When low flow conditions persist and overall diversion amounts do not exceed the conveyance capacity of the aqueduct, the streams can be dewatered below the diversions resulting in negative impacts on species habitat and passage. This scenario was intended to represent the diversion conditions maximum diversion at low flow conditions.
3. Current Conditions: Under this scenario the impacts of the diversions were modeled as the CWRM staff recommended IIFS discharge released at sluice gates on the ditch downstream of the North Fork and Waikoko diversions. The primary difference between this scenario and the IIFS Flow restoration scenario is that the water is returned from the ditch and not remaining in the stream channel at the point of diversion. Thus, an area of stream between the diversion and the sluice gate water return may still be dewatered, entrainment in the ditch system was higher, and connectivity lower than when modification to the diversion structures will allow water to pass the over the diversion and remain in the stream channel.
4. IIFS Flow Restoration: Under this scenario the impacts of the diversions reflect required flow volumes to remain in the streams at the points of diversion as recommended by CWRM staff but not adopted by the Commission. The IIFS flow volume recommendations are intended to balance public trust uses, environmental, cultural and off stream uses of water. The IIFS flows provide habitat in the stream

during low flow periods and can provide a pathway for animal movement past the diversions.

Although this project focuses on the streams and watersheds associated with the Upper and Lower Waiahi Hydropower system in the Wailua River system, as part of the modeling process the whole Wailua River watershed was included in the model. Table 29 shows the basin characteristics used in the model and Table 30 shows the habitat units for native amphidromous stream species prior to assessing diversion, waterfall, and predation impacts. Figure 139 to Figure 146 show the map distribution of the native amphidromous stream species. The results of the HSHEP model runs for the various scenarios were summarized in the tables as follows:

- Table 31- HSHEP Model results for sub-basin areas under the No Diversion and Full Diversion scenarios.
- Table 32 - HSHEP Model results for sub-basin areas under the Current Diversion and IIFS Diversion scenarios.
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- Table 33 - HSHEP Model results for Full Watershed and Lower Basin areas comparing all scenarios.
- Table 34 - HSHEP Model results for Hydropower Impact and North Fork and Waikoko Impact areas comparing all scenarios.
- Table 35 - HSHEP Model results for South Fork areas comparing all scenarios.

In the No Diversion scenario results, the species with the most habitat units in the full Wailua River watershed were ʻoʻopu nakea (*Awaous stamenius*), ʻoʻopu nōpili (*Sicyotperus stimpsoni*), ʻoʻopu naniha (*Stenogobius hawaiiensis*) and ʻoʻopu alamoʻo (*Lentipes concolor*). In contrast to the full watershed, only ʻōpae kalaʻole (*Atyoida bisulcata*) was expected to have many habitat units in the Hydropower Impact Area (see Figure 11). When viewing the total combined habitat units for all species, the results show that the majority of the habitat for native amphidromous stream animals is located in the lower basins below the Hydropower Impact Area where 98.5% of all habitat units were predicted to occur in the lower basins. Given the location of the Upper and Lower Waiahi Hydropower system in the upper reaches Wailua River system, it is not surprising that more habitat is located closer to the ocean for migratory stream species. Overall only 1.5% of total habitat units were predicted to occur within the Hydropower Impact Area. This pattern of overall habitat units by species was consistent among all scenarios.

Another way to look at the results is to compare the scenarios within the different basin groupings. The pattern for the full watershed and the lower basins appeared similar among the four scenarios. Approximately 69% of habitat units were expected to occur under the three water diversion scenarios (full diversion, current conditions, and IIFS flow restoration). More interestingly was the comparison of the various hydropower impact groups. In the overall Hydropower Impact Area, full diversion eliminated 73.7% of total habitat units. Only a slight increase in Habitat Units was observed under the current conditions scenario as the diversions continued to entrain downstream drifting larvae into the ditch system. A substantial improvement

from 28.5% to 42.8% was predicted for the IIFS flow restoration scenario where the diversions are modified to allow water to directly pass the diversion, remaining in the stream channel and thus minimizing entrainment. When specifically looking at the North Fork and Waikoko diversions, the same pattern emerges. Comparing current conditions to the IIFS flow restoration of the diversions to minimize entrainment nearly doubles the expected habitat units from 5,571 m^2 to 9,405 m^2 of HU in the area.

The overall pattern appears consistent with the field observations as no native amphidromous stream species except for ʻōpae kalaʻole (*Atyoida bisulcata*) were observed in the hydropower impact area. In the sites surveyed below the large waterfalls, most of the native amphidromous stream species were observed and in relatively large numbers suggesting that overall habitat availability is much higher for native amphidromous stream species in the lower segments of this watershed.

Questions with past modeling efforts associated with the Upper and Lower Waiahi Hydropower system were associated with the impact of the large waterfalls functioning as barriers to upstream movement and the role of predation by smallmouth bass. To address if these variables which occur downstream of the Hydropower Impact Area were highly sensitive to the impact values input into the model, we ran IIFS flow restoration scenarios with decreased impacts of the waterfalls and predation as well as increased impacts of the waterfalls and predation to see if the patterns changed (Table 36 and Table 37). The pattern observed was not substantially different than the primary model. As the effect of the large waterfalls as barriers and predation by smallmouth bass decreased, more overall habitat units were expected to occur within the Wailua River system. Conversely, as the barrier effect of the large waterfalls and predation impact of smallmouth bass increased, fewer overall habitat units for native stream species were expected to occur in the river system.

While these changes follow the expected direction of change, the overall impact of these changes was very slight on the model in terms of percent of habitat expected in the Hydropower Impact Area. With lower impacts there was a slight increase from 1.5% to 1.9% of total habitat units expected within the hydropower impact area and with higher impacts there was a slight decrease from 1.5% to 0.4% of the habitat units expected to occur within the Hydropower Impact Area. This result suggests that the model is not overly sensitive to the values chosen for these impacts and that the overall pattern with the majority of habitat found downstream of the Hydropower Impact Area is likely not only the result of either the large waterfalls functioning as barriers or smallmouth bass preying on native stream animals. It is likely even without these two factors, the majority of stream habitat for native amphidromous stream animals would not be found in the Hydropower Impact Area.

Table 28: HSHEP Model Scenario impact values

No Diversion Model		
	Remaining baseflow	passage / entrainment / predation
Predation Impact	1	0.8
Major Diversions	1	1
Lower Diversions	1	1
Minor Diversions	1	1
Major Waterfalls	1	0.4
Hanamalu Diversions	0.7	0.56
Reservoir Diversions	0.7	0.56
Upper Grove Farm Diversion	0.7	0.56
Full Diversion Model		
Predation Impact	1	0.8
Major Diversions	0	0.3
Lower Diversions	0	0.1
Minor Diversions	0	0.1
Major Waterfalls	1	0.4
Hanamalu Diversions	0	0.4
Reservoir Diversions	0	0.4
Upper Grove Farm Diversion	0	0.4
Current Diversion Model		
Predation Impact	1	0.8
Major Diversions	0.8	0.3
Lower Diversions	0	0.1
Minor Diversions	0	0.1
Major Waterfalls	1	0.4
Hanamalu Diversions	0	0.4
Reservoir Diversions	0	0.4
Upper Grove Farm Diversion	0	0.4
IIFS Model		
Predation Impact	1	0.8
Major Diversions	0.8	0.86
Lower Diversions	0	0.1
Minor Diversions	0	0.1
Major Waterfalls	1	0.4
Hanamalu Diversions	0	0.4
Reservoir Diversions	0	0.4
Upper Grove Farm Diversion	0	0.4

Table 29: Basin Information for Wailua HSHEP Model.

Basin ID	Downstream Basin ID	Downstream Node ID	Section	Forest Reserve	Sub Section	Area (m2)	Annual Mean Rainfall (mm)	Annual Total Rainfall (mm)	BFQ_{50} (cfs)
1	0	1	Wailua	No	Wailua	5,915,800	2,659	79,114,100	3.80
2	1	2	NF	No	NorthFork	6,491,800	88,050	120,993,000	5.81
3	1	3	Opaekaa	No	Opaekaa	15,641,100	104,209	293,832,000	14.10
4	2	4	NF	No	NorthFork	6,651,000	638,099	153,355,000	7.36
5	4	6	NF	Yes	EastFork	16,235,800	162,582	506,581,000	24.32
6	4	6	NF	Yes	NorthFork	2,144,200	1,702,170	57,671,400	2.77
7	6	8	NF	Yes	NorthFork	446,600	45,072	12,995,500	0.62
8	6	8	NF	Yes	NorthFork	35,300	4,629	1,005,440	0.05
9	8	10	NF	Yes	NorthFork	870,400	682	26,814,000	1.29
10	8	10	NF	Yes	NorthFork	694,700	44,958	21,027,100	1.01
11	20	21	SF	Yes	StableStormDtich	225,500	17,987	7,112,190	0.34
12	10	14	NF	Yes	NorthFork	5,497,900	3,077	234,159,000	11.24
13	10	14	NF	Yes	NorthFork	1,370,000	744,240	55,445,500	2.66
14	10	14	NF	Yes	NorthFork	1,799,800	142,276	71,834,100	3.45
15	56	15	NF	Yes	NorthFork	4,462,500	128,187	277,546,000	13.32
16	1	16	SF	No	SouthFork	4,565,200	879,902	77,557,300	3.72
17	16	17	SF	No	SouthFork	17,136,900	58,166	393,090,000	18.87
18	17	46	SF	No	StableStormDtich	192,900	353,457	5,136,190	0.25
19	18	27	SF	No	StableStormDtich	2,218,600	3,082	62,802,100	3.01
20	19	22	SF	Yes	StableStormDtich	214,400	59,543	6,348,460	0.30
21	20	21	SF	Yes	StableStormDtich	390,400	3,849	13,038,600	0.63
22	19	22	SF	Yes	Waikoko	93,400	8,056	2,711,310	0.13
23	22	25	SF	Yes	Waikoko	890,700	2,438	29,101,000	1.40
24	57	24	SF	Yes	Waikoko	456,300	29,338	15,877,500	0.76
25	57	24	SF	Yes	Waikoko	1,373,500	13,348	51,313,100	2.46
26	55	26	SF	Yes	Waikoko	2,840,600	81,833	142,632,000	6.85
27	18	27	SF	No	Iliiliula	440,000	369,223	12,299,300	0.59
28	27	28	SF	No	Iliiliula	42,000	12,052	1,208,460	0.06
29	28	41	SF	No	Iliiliula	162,900	907	4,746,490	0.23
30	29	39	SF	No	Iliiliula	416,000	4,796	12,486,500	0.60
31	30	33	SF	Yes	Iliiliula	816,200	17,211	28,984,800	1.39
32	31	32	SF	Yes	Iliiliula	231,800	27,299	9,213,680	0.44
33	30	33	SF	No	Iliiliula	645,300	26,410	22,019,300	1.06
34	33	36	SF	No	Iliiliula	110,800	23,615	4,163,310	0.20
35	34	35	SF	No	Iliiliula	309,700	5,730	12,651,400	0.61
36	33	36	SF	No	Iliiliula	876,500	36,672	34,973,400	1.68
37	36	37	SF	No	Iliiliula	873,600	55,141	37,791,500	1.81
38	36	38	SF	No	Iliiliula	3,878,100	98,970	230,891,000	11.08
39	29	39	SF	No	Iliiliula trib2	216,800	910,961	6,678,880	0.32
40	39	40	SF	No	Iliiliula trib2	168,000	10,647	5,585,240	0.27
41	28	41	SF	No	Waiaka	549,800	7,517	16,902,900	0.81
42	41	42	SF	No	Waiaka	877,800	26,169	30,789,800	1.48
43	42	43	SF	No	Waiaka	471,300	40,018	19,302,000	0.93
44	27	28	SF	No	Iliiliula trib2	788,300	28,681	23,426,500	1.12
45	44	45	SF	No	Iliiliula trib1	139,400	27,121	4,548,610	0.22
46	17	46	SF	No	Waiahi	1,552,600	4,024	42,872,100	2.06
47	46	50	SF	No	Waiahi_Trib	512,500	35,012	15,437,500	0.74
48	47	48	SF	No	Waiahi_Trib	620,100	28,371	21,422,400	1.03
49	48	49	SF	No	Waiahi_Trib	314,100	25,410	11,947,100	0.57
50	46	50	SF	No	Waiahi	10,513,400	17,815	331,256,000	15.90
51	50	53	SF	No	Waiahi	423,400	366,215	14,596,300	0.70
52	51	52	SF	No	Waiahi	231,100	18,497	8,857,730	0.43
53	50	53	SF	No	Waiahi	522,600	14,389	18,315,800	0.88
54	53	54	SF	No	Waiahi	10,647,400	23,672	534,483,000	25.66
55	25	55	SF	Yes	Waikoko	12,400	1,659,450	514,669	0.02
56	14	56	NF	Yes	NF	14,000	293	622,023	0.03
57	22	25	SF	Yes	Waikoko	249,000	457	7,614,260	0.37
58	53	58	SF	No	Waiahi	68,500	3,978	2,425,830	0.12

Table 30: HSHEP Model values Habitat Units (m) and percent for native amphidromous stream species in the Wailua River watershed. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), and SS= ʻOʻopu nōpili (Sicyotperus stimpsoni).

Basin ID	AB HU	AS HU	ES HU	LC HU	MG HU	NG HU	SH HU	SS HU
1	338	20,237	3,441	2,791	4,384	4,873	18,832	14,612
2	3,768	13,609	22	6,603	10	5,750	2,115	12,689
3	17,291	18,892	911	89,831	1,741	11,854	8,670	17,881
4	2,979	2,841	0	14,896	0	1,640	0	2,344
5	25,117	8,203	0	22,361	0	1,214	0	6,964
6	1,572	1,372	0	4,284	0	9	0	1,126
7	841	462	0	727	0	0	0	366
8	128	137	0	139	0	57	0	123
9	0	0	0	0	0	0	0	0
10	772	471	0	673	0	6	0	363
11	581	269	0	502	0	0	0	228
12	22,008	4,358	0	1,222	0	21	0	1,427
13	6	3	0	5	0	0	0	2
14	3,732	1,728	0	978	0	18	0	692
15	13,673	640	0	10	0	4	0	152
16	356	9,187	29	3,872	301	1,127	3,885	5,246
17	8,194	680	0	1,513	0	17	0	64
18	911	86	0	4	0	6	0	0
19	4,117	568	0	0	0	0	0	0
20	1,289	318	0	316	0	0	0	143
21	647	300	0	559	0	0	0	254
22	634	148	0	1	0	2	0	0
23	11	3	0	0	0	0	0	0
24	2,146	265	0	0	0	0	0	0
25	7,375	612	0	1	0	1	0	0
26	52,590	0	0	3	0	0	0	0
27	1,281	115	0	0	0	0	0	0
28	247	22	0	0	0	0	0	0
29	541	49	0	0	0	0	0	0
30	1,061	188	0	0	0	0	0	0
31	4,832	530	0	0	0	0	0	0
32	1,295	33	0	0	0	0	0	0
33	2,451	418	0	1	0	1	0	0
34	1,738	113	0	0	0	0	0	0
35	2,066	50	0	0	0	0	0	0
36	4,216	325	0	1	0	1	0	0
37	4,356	41	0	0	0	0	0	0
38	31,818	66	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0
41	3,890	545	0	1	0	2	0	0
42	4,736	384	0	1	0	1	0	0
43	5,334	52	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0
46	4,286	516	0	0	0	0	0	0
47	3,247	604	0	1	0	1	0	0
48	2,697	238	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0
50	52,213	2,814	0	5	0	5	0	0
51	9,372	1	0	1	0	1	0	0
52	3,485	0	0	0	0	0	0	0
53	1,245	0	0	0	0	0	0	0
54	35,056	3	0	3	0	2	0	0
55	1,010	0	0	0	0	0	0	0
56	247	67	0	0	0	0	0	19
57	596	97	0	0	0	0	0	0
58	692	0	0	0	0	0	0	0

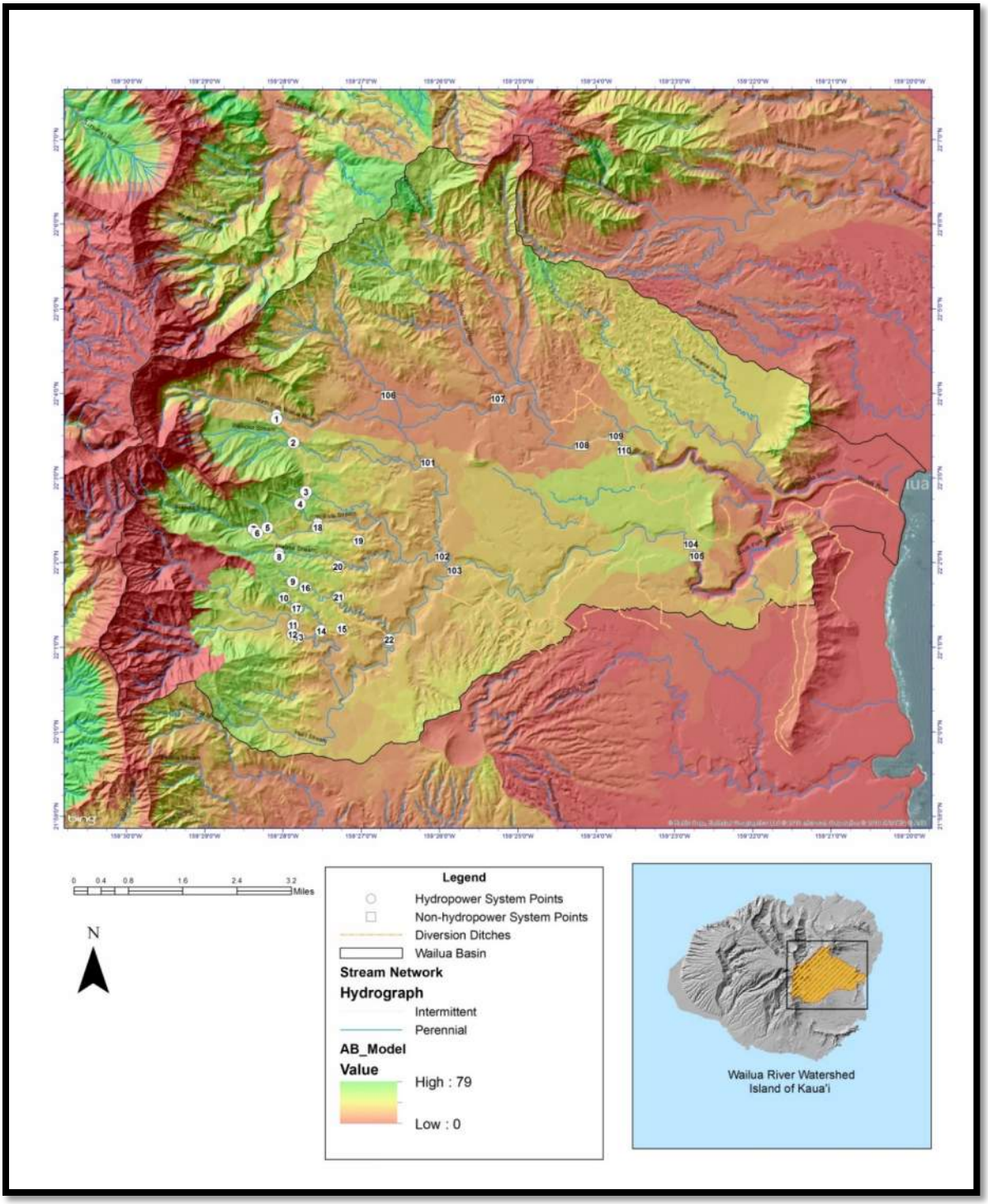

Figure 139: Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native crustacean, *Atyoida bisulcata*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

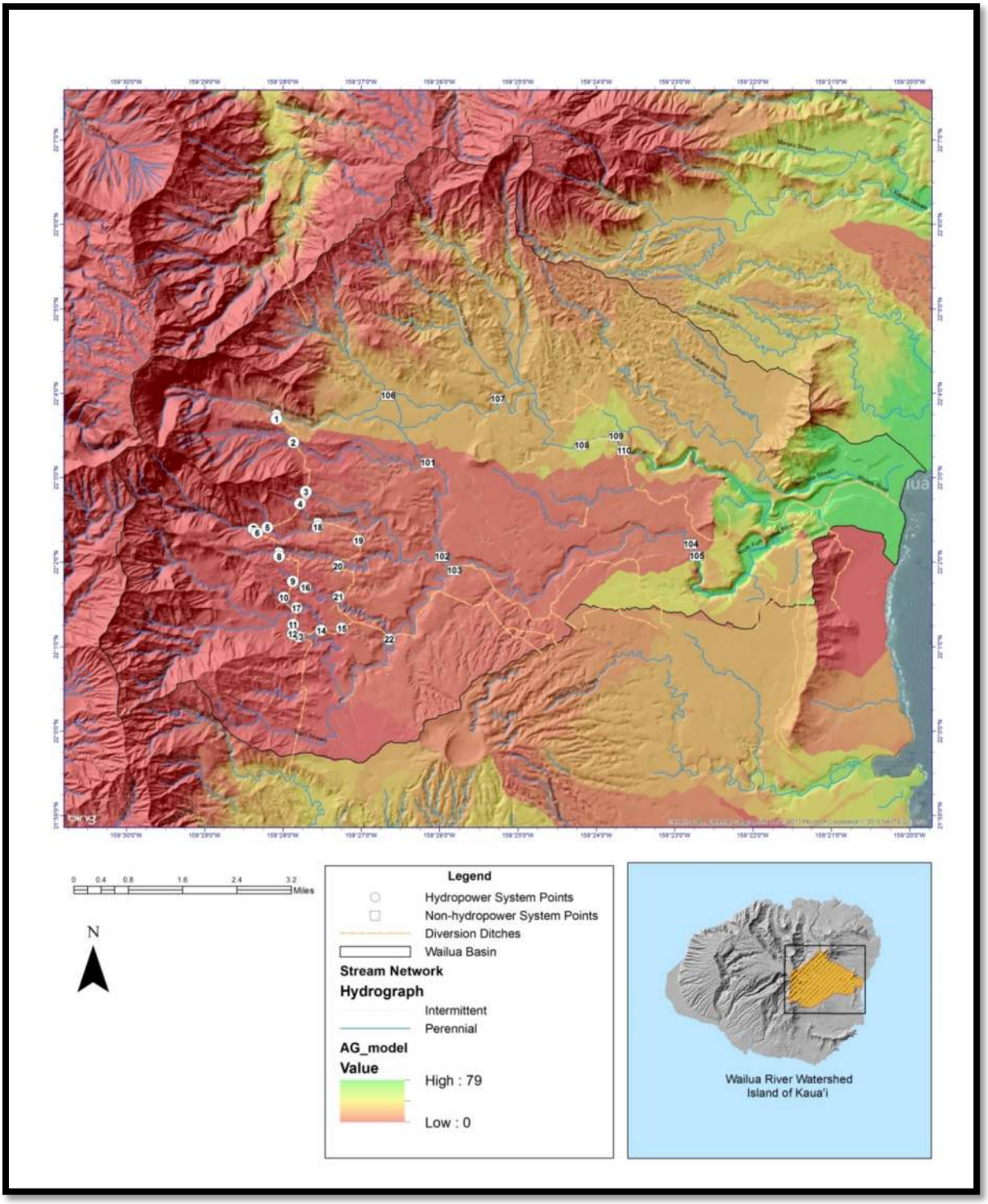

Figure 140:Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native fish, *Awaous stamenius*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

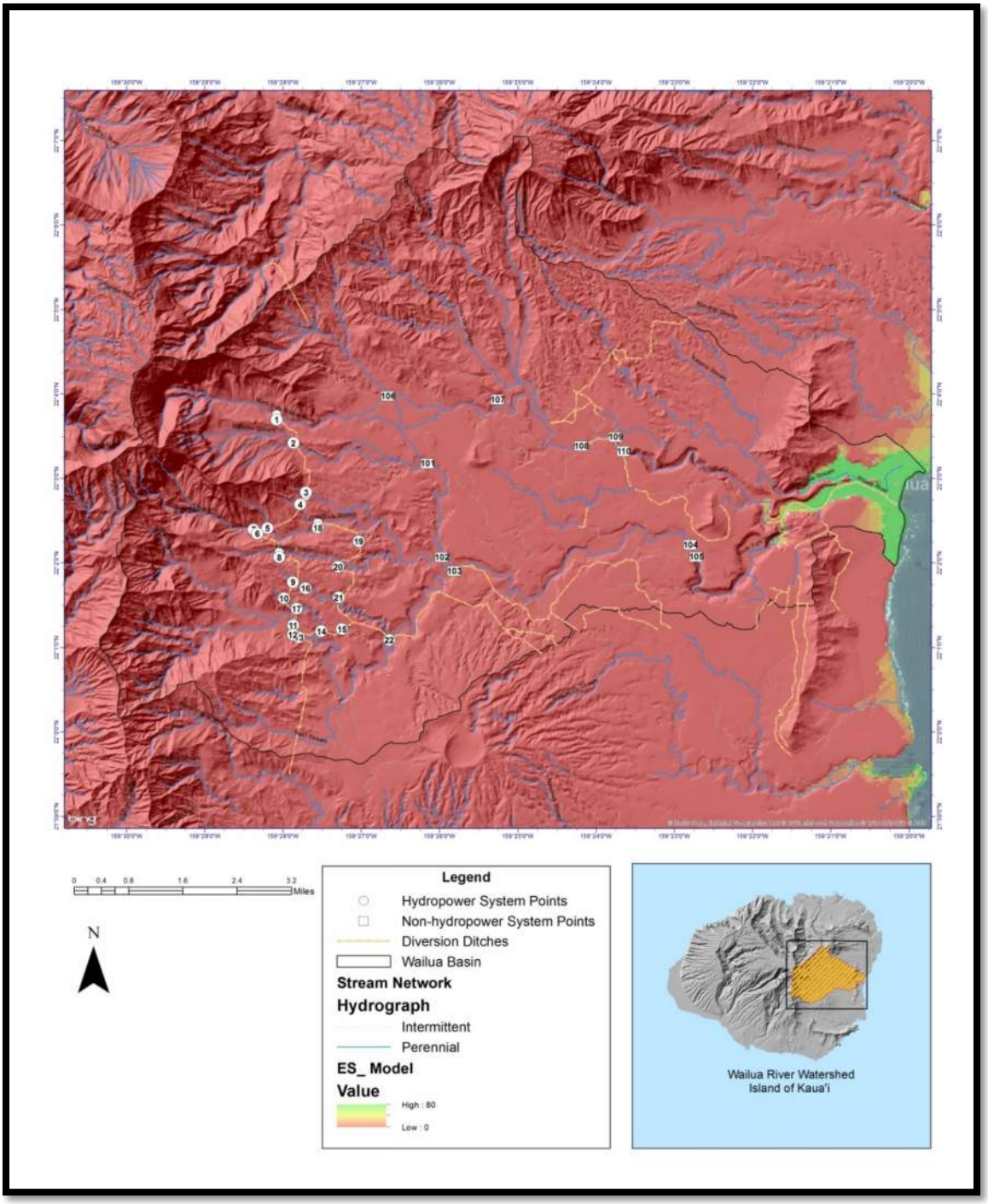

Figure 141:Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native fish, *Eleotris sandwicensis*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

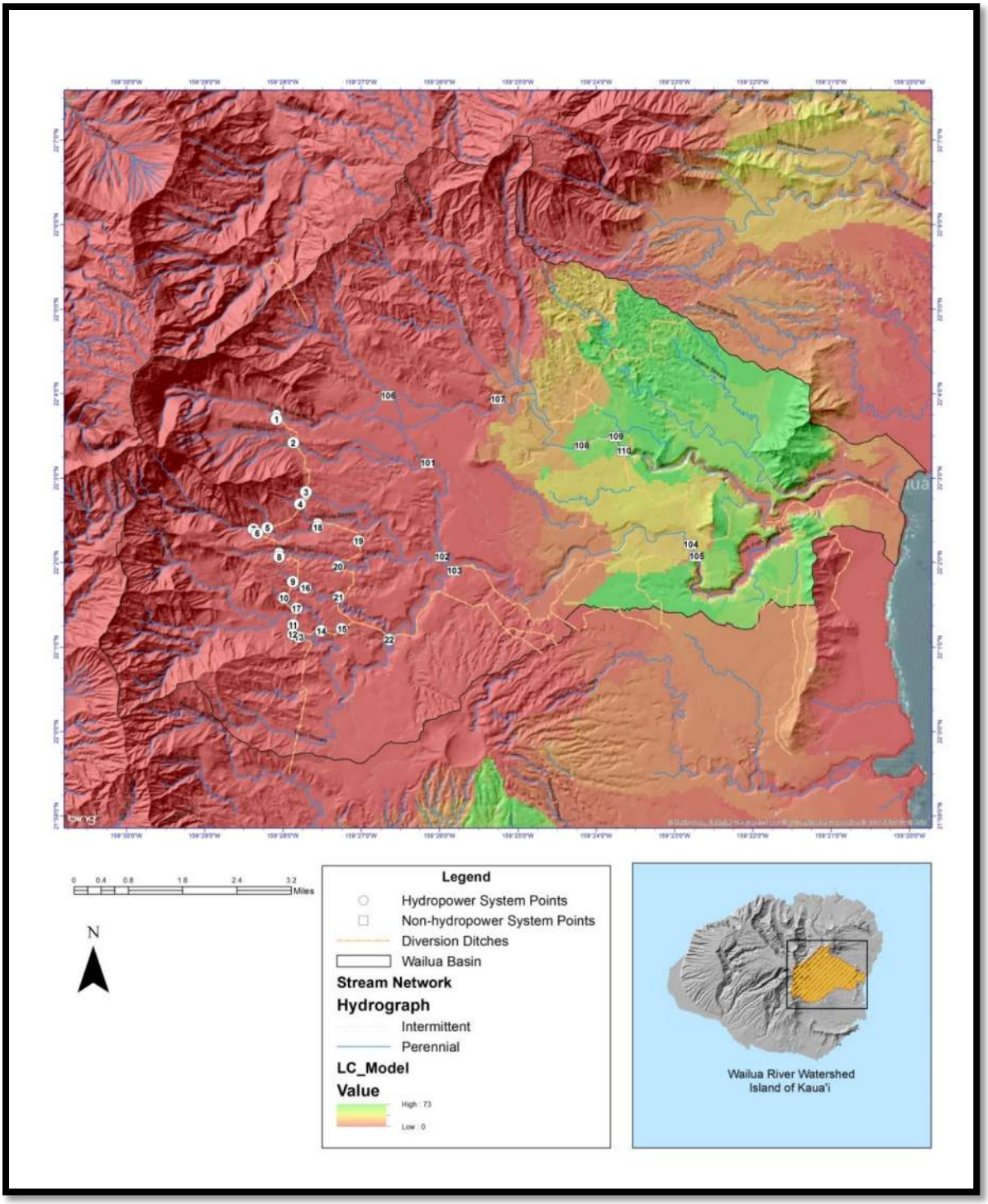

Figure 142:Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native fish, *Lentipes concolor*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

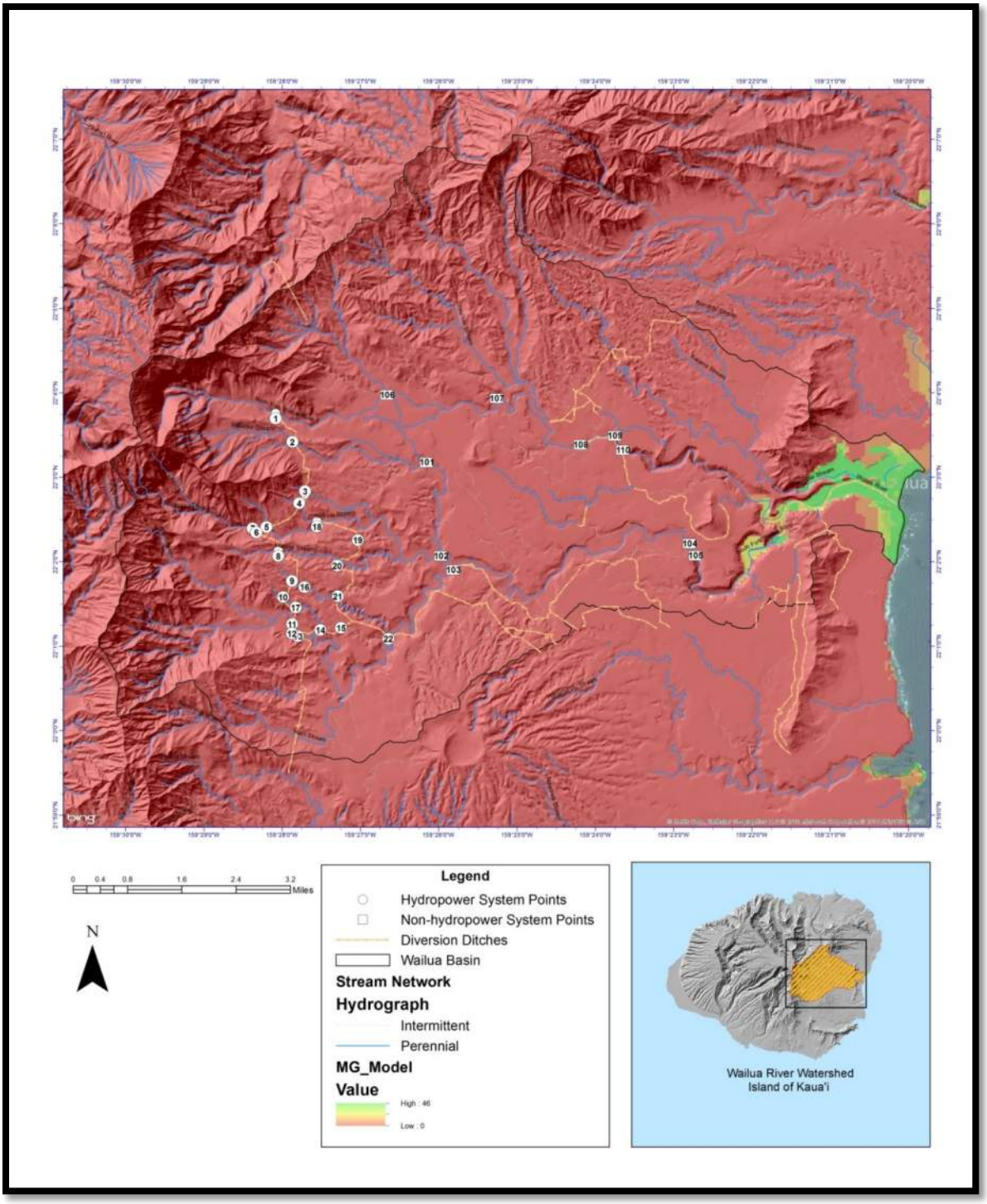

Figure 143: Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native crustacean, *Macrobrachium grandimanus*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

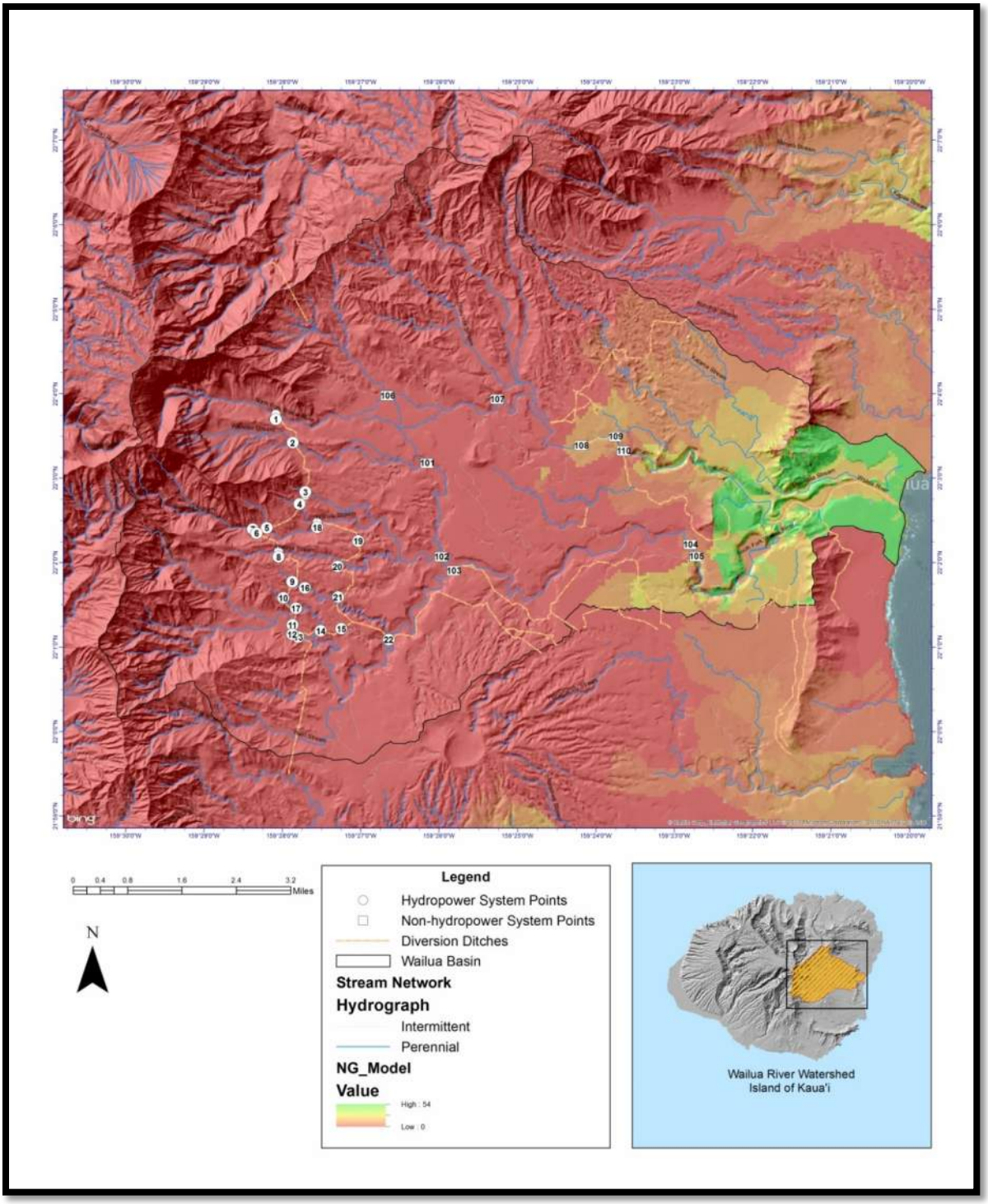

Figure 144: Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native mollusk, *Neritina granosa*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

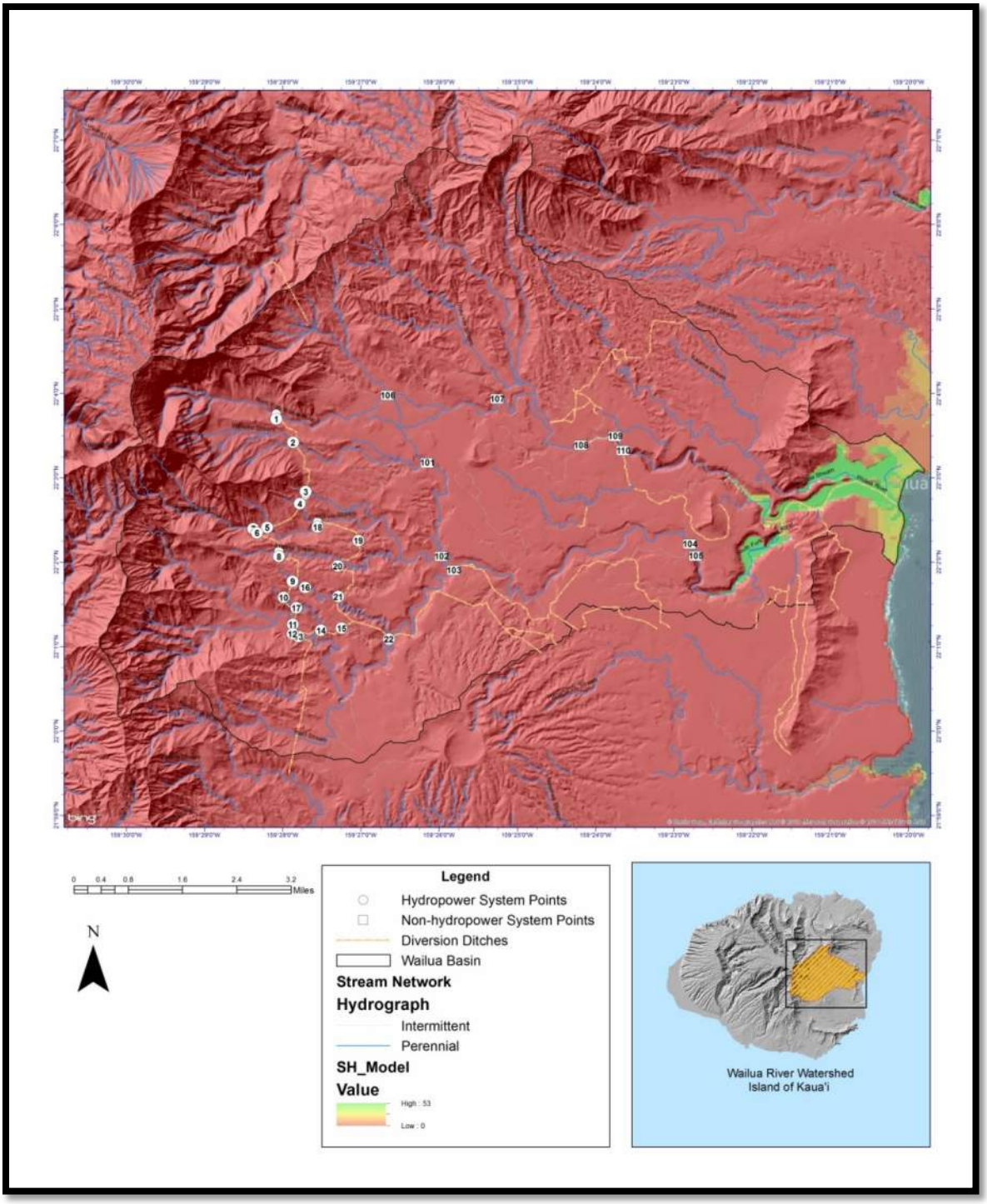

Figure 145: Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native fish, *Stenogobius hawaiiensis*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

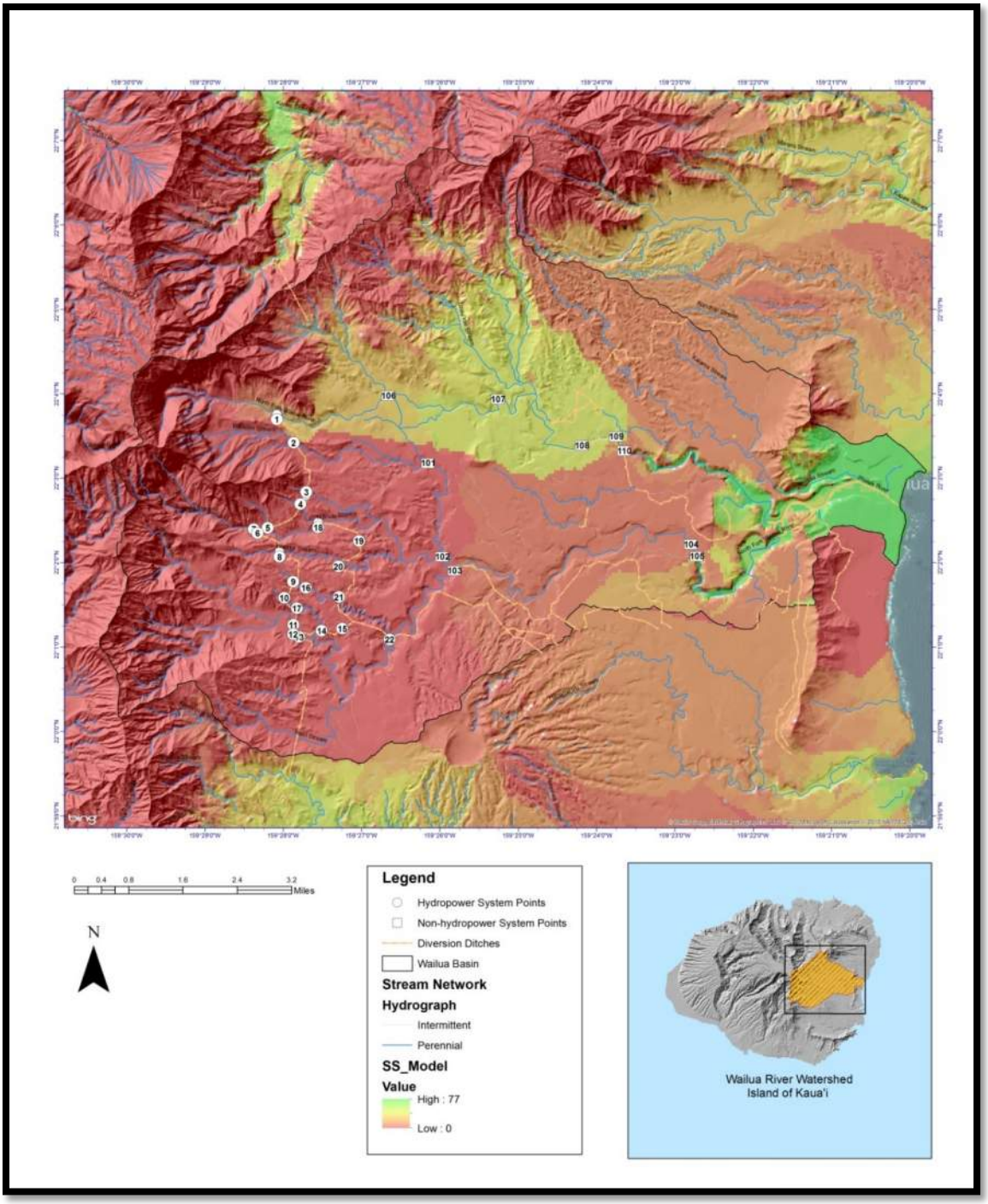

Figure 146: Map of expected natural (without the presence of the upper and lower hydropower facilities considered) habitat suitability for the native fish, *Sicyopterus stimpsoni*, based on the HSEHP model. Green is high suitability and red is low suitability. For visual purposes the habitat suitability colors are displayed across the watershed (land included). In the actual modeled results, the suitable habitat is only found within the stream channels.

Table 31: HSHEP Model results for sub-basin areas under the No Diversion and Full Diversion scenarios. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), SS= ʻOʻopu nōpili (Sicyotperus stimpsoni), and total HU = All Species Combined.

No Diversion Model									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	187,503	894,607	92,374	440,186	124,578	223,374	611,427	642,551	3,216,599
Lower basins	143,291	892,321	92,374	439,859	124,578	223,365	611,427	642,279	3,169,493
Hydro Area	44,212	2,286	0	327	0	9	0	272	47,106
NF + Waikoko	12,161	1,134	0	742	0	11	0	497	14,546
South Fork	33,805	1,578	0	2	0	2	0	0	35,387
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	76.4%	99.7%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	98.5%
Hydro Area	23.6%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	1.5%
NF + Waikoko	6.5%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.5%
South Fork	18.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Full Diversion Model									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	120,725	597,997	63,391	338,499	85,508	153,117	415,458	432,085	2,206,779
Lower basins	109,365	597,198	63,391	338,360	85,508	153,114	415,458	431,978	2,194,372
Hydro Area	11,360	799	0	138	0	3	0	107	12,407
NF + Waikoko	3,499	511	0	404	0	5	0	251	4,671
South Fork	8,789	530	0	1	0	1	0	0	9,320
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	90.6%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%
Hydro Area	9.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
NF + Waikoko	2.9%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
South Fork	7.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%

Table 32: HSHEP Model results for sub-basin areas under the Current Diversion and IIFS Diversion scenarios. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), SS= ʻOʻopu nōpili (Sicyotperus stimpsoni), and total HU = All Species Combined.

Current Diversion Model									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	121,726	598,326	63,391	338,894	85,508	153,123	415,458	432,242	2,208,668
Lower basins	109,671	597,342	63,391	338,666	85,508	153,118	415,458	432,072	2,195,225
Hydro Area	12,055	984	0	228	0	5	0	170	13,443
NF + Waikoko	3,995	713	0	525	0	7	0	331	5,571
South Fork	9,005	532	0	1	0	1	0	0	9,538
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	90.1%	99.8%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	99.4%
Hydro Area	9.9%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.6%
NF + Waikoko	3.3%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.3%
South Fork	7.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
IIFS Model									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	128,362	598,401	63,391	338,895	85,508	153,124	415,458	432,260	2,215,399
Lower basins	109,671	597,342	63,391	338,666	85,508	153,118	415,458	432,072	2,195,225
Hydro Area	18,691	1,059	0	230	0	6	0	188	20,174
NF + Waikoko	7,735	787	0	527	0	8	0	349	9,405
South Fork	11,901	532	0	1	0	1	0	0	12,435
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	85.4%	99.8%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	99.1%
Hydro Area	14.6%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.9%
NF + Waikoko	6.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.4%
South Fork	9.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%

Table 33: HSHEP Model results for Full Watershed and Lower Basin areas comparing all scenarios. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), SS= ʻOʻopu nōpili (Sicyotperus stimpsoni), and total HU = All Species Combined.

Full Watershed (m2)									
	AB HU	AS HU	ES HU	LC HU	MG HU	NG HU	SH HU	SS HU	Total HU
No Diversion	187,503	894,607	92,374	440,186	124,578	223,374	611,427	642,551	3,216,599
Full Diversion	120,725	597,997	63,391	338,499	85,508	153,117	415,458	432,085	2,206,779
Current Conditions	121,726	598,326	63,391	338,894	85,508	153,123	415,458	432,242	2,208,668
IIFS Flow Restoration	128,362	598,401	63,391	338,895	85,508	153,124	415,458	432,260	2,215,399
Full Watershed (%)									
No Diversion	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Full Diversion	64.4%	66.8%	68.6%	76.9%	68.6%	68.5%	67.9%	67.2%	68.6%
Current Conditions	64.9%	66.9%	68.6%	77.0%	68.6%	68.6%	67.9%	67.3%	68.7%
IIFS Flow Restoration	68.5%	66.9%	68.6%	77.0%	68.6%	68.6%	67.9%	67.3%	68.9%
Lower basins									
	AB HU	AS HU	ES HU	LC HU	MG HU	NG HU	SH HU	SS HU	Total HU
No Diversion	143,291	892,321	92,374	439,859	124,578	223,365	611,427	642,279	3,169,493
Full Diversion	109,365	597,198	63,391	338,360	85,508	153,114	415,458	431,978	2,194,372
Current Conditions	109,671	597,342	63,391	338,666	85,508	153,118	415,458	432,072	2,195,225
IIFS Flow Restoration	109,671	597,342	63,391	338,666	85,508	153,118	415,458	432,072	2,195,225
Lower basins									
No Diversion	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Full Diversion	76.3%	66.9%	68.6%	76.9%	68.6%	68.5%	67.9%	67.3%	69.2%
Current Conditions	76.5%	66.9%	68.6%	77.0%	68.6%	68.6%	67.9%	67.3%	69.3%
IIFS Flow Restoration	76.5%	66.9%	68.6%	77.0%	68.6%	68.6%	67.9%	67.3%	69.3%

Table 34: HSHEP Model results for Hydropower Impact and North Fork and Waikoko Impact areas comparing all scenarios. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), SS= ʻOʻopu nōpili (Sicyotperus stimpsoni), and total HU = All Species Combined.

Hydro Area									
	AB HU	AS HU	ES HU	LC HU	MG HU	NG HU	SH HU	SS HU	Total HU
No Diversion	44,212	2,286	0	327	0	9	0	272	47,106
Full Diversion	11,360	799	0	138	0	3	0	107	12,407
Current Conditions	12,055	984	0	228	0	5	0	170	13,443
IIFS Flow Restoration	18,691	1,059	0	230	0	6	0	188	20,174
Hydro Area									
No Diversion	100.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	100.0%
Full Diversion	25.7%	34.9%	0.0%	42.3%	0.0%	36.9%	0.0%	39.2%	26.3%
Current Conditions	27.3%	43.0%	0.0%	69.8%	0.0%	55.5%	0.0%	62.6%	28.5%
IIFS Flow Restoration	42.3%	46.3%	0.0%	70.3%	0.0%	61.9%	0.0%	69.2%	42.8%
NF + Waikoko									
	AB HU	AS HU	ES HU	LC HU	MG HU	NG HU	SH HU	SS HU	Total HU
No Diversion	12,161	1,134	0	742	0	11	0	497	14,546
Full Diversion	3,499	511	0	404	0	5	0	251	4,671
Current Conditions	3,995	713	0	525	0	7	0	331	5,571
IIFS Flow Restoration	7,735	787	0	527	0	8	0	349	9,405
NF + Waikoko									
No Diversion	100.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%	100.0%
Full Diversion	28.8%	45.1%	0.0%	54.5%	0.0%	47.9%	0.0%	50.4%	32.1%
Current Conditions	32.9%	62.8%	0.0%	70.8%	0.0%	66.1%	0.0%	66.5%	38.3%
IIFS Flow Restoration	63.6%	69.4%	0.0%	70.9%	0.0%	69.9%	0.0%	70.2%	64.7%

Table 35: HSHEP Model results for South Fork areas comparing all scenarios. AB = ʻŌpae kalaʻole (Atyoida bisulcata), AS = ʻOʻopu nakea (Awaous stamenius), ES = ʻOʻopu akupa (Eleotris sandvicensis), LC = ʻOʻopu alamoʻo (Lentipes concolor), MG = ʻŌpae oehaʻa (Macrobrachium grandimanus), NG = Hihiwai (Neritina granosa), SH = ʻOʻopu naniha (Stenogobius hawaiiensis), SS= ʻOʻopu nōpili (Sicyotperus stimpsoni), and total HU = All Species Combined.

South Fork									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
No Diversion	33,805	1,578	0	2	0	2	0	0	35,387
Full Diversion	8,789	530	0	1	0	1	0	0	9,320
Current Conditions	9,005	532	0	1	0	1	0	0	9,538
IIFS Restoration	11,901	532	0	1	0	1	0	0	12,435
South Fork									
No Diversion	100.0%	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Full Diversion	26.0%	33.6%	0.0%	25.2%	0.0%	27.2%	0.0%	0.0%	26.3%
Current Cond.	26.6%	33.7%	0.0%	25.5%	0.0%	27.5%	0.0%	0.0%	27.0%
IIFS Restoration	35.2%	33.7%	0.0%	36.4%	0.0%	35.6%	0.0%	0.0%	35.1%

Table 36: HSHEP Model results for sub-basin areas under the IIFS Diversion scenario with lower impacts for waterfall barrier and predation from smallmouth bass.

IIFS Model - Low Waterfall and Predation									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	210,754	710,926	71,386	420,743	96,801	179,985	476,444	511,448	2,678,488
Lower basins	163,981	708,371	71,386	420,161	96,801	179,970	476,444	510,971	2,628,087
Hydro Area	46,773	2,555	0	582	0	14	0	477	50,401
NF + Waikoko	20,962	2,015	0	1,335	0	19	0	884	25,216
South Fork	28,142	1,197	0	2	0	2	0	0	29,343
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	77.8%	99.6%	100.0%	99.9%	100.0%	100.0%	100.0%	99.9%	98.1%
Hydro Area	22.2%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	1.9%
NF + Waikoko	9.9%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.2%	0.9%
South Fork	13.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%

Table 37: HSHEP Model results for sub-basin areas under the IIFS Diversion scenario with higher impacts for waterfall barrier and predation from smallmouth bass.

IIFS Model – High Waterfall and Predation									
	AB HU (m2)	AS HU (m2)	ES HU (m2)	LC HU (m2)	MG HU (m2)	NG HU (m2)	SH HU (m2)	SS HU (m2)	Total HU (m2)
Full Watershed	80,976	497,420	55,412	272,774	74,349	128,419	356,484	360,529	1,826,363
Lower basins	74,490	497,038	55,412	272,697	74,349	128,417	356,484	360,466	1,819,351
Hydro Area	6,486	383	0	77	0	2	0	63	7,012
NF + Waikoko	2,423	262	0	177	0	3	0	117	2,982
South Fork	4,394	209	0	0	0	0	0	0	4,604
	AB HU (%)	AS HU (%)	ES HU (%)	LC HU (%)	MG HU (%)	NG HU (%)	SH HU (%)	SS HU (%)	Total HU (%)
Full Watershed	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lower basins	92.0%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.6%
Hydro Area	8.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
NF + Waikoko	3.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%
South Fork	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%

CONCLUSIONS

We surveyed instream habitat, biota and flow characteristics and used the results to update and verify the results of a previously created HSHEP model of the upper Wailua River system on Kauaʻi. The main goal of the study focused on quantifying the impacts of the Upper and Lower Waiahi Hydropower system on habitat for native amphidromous stream species as part of environmental assessment associated with an application for a water lease. From a fieldwork perspective, we gathered habitat and biota throughout the river system from below the first major waterfalls to sites above the diversions. We also gathered stream discharge information to better understand the gains and losses in the streamflow below the North Fork and Waikoko Diversions. From a modeling perspective, we updated the prior HSHEP model developed for the Upper and Lower Waiahi Hydropower System to verify the conclusions from the 2013 study are still valid. The field surveys and modeling work are intended to document issues raised during the first study with the goal of decreasing some uncertainty of the modeling assumptions to subsequently increase the reliability of the modeled predications.

As part of the impact assessment for this project, we used the updated HSHEP model to document current conditions and predict how under the CWRM staff recommended IIFS implementation changes affect the habitat available for native amphidromous stream animals. The strength of the HSHEP approach is the application of objectively created distribution and habitat use criteria for the native amphidromous stream animals with spatially accurate depictions of the stream and hydropower systems. The HSHEP approach considered local habitat conditions as well as migratory barriers and entrainment issues in determining suitable habitat units for each species. The application of standardized species distribution and habitat use criteria applied to the local stream and hydropower project conditions provided a consistent and unbiased description of suitable habitat and potential impacts on that habitat.

Changes to the HSHEP model methodology since the 2014 Upper and Lower Waihi HSHEP model report were based on its application to other instream flow issues in Hawaiʻi and have improved its utility in quantifying instream conditions and modeling project scenarios. During the HSHEP's application to potential flow and stream channel modifications in the Ala Wai system on Oʻahu (Parham, 2015), the HSHEP underwent a peer-review process by the US Army Corps of Engineers to assess it applicability to impact assessment in Hawaiian streams. The HSHEP model and the stream habitat and biota surveys used in this project passed the model review process and were accepted as an appropriate model of impact assessment.

Most of the habitat quantification in this report was the same as the habitat quantification for the prior HSHEP model created for KIUC. Differences between this 2019 Upper and Lower Waiahi Hydropower HSHEP model and the 2013 Upper and Lower Waiahi Hydropower HSHEP model primarily were:

1. Larger Number of Basins: The 2019 Upper and Lower Waiahi Hydropower HSHEP model included more basins as each diversion or area of impact is associated with its own upstream basin.

2. Different estimate of stream discharge: The 2019 Upper and Lower Waiahi Hydropower HSHEP model used modified regression equations to account for any discharge at the many ungaged sites. These discharge estimates are likely proportionally consistent across the study area, but they are not as accurate direct measures of stream discharge.

3. Habitat Units more proportional to stream size: The 2013 Upper and Lower Waiahi Hydropower HSHEP model calculated habitat units as a linear measurement and reported it in total meters of habitat units. The 2019 Upper and Lower Waiahi Hydropower HSHEP model used the estimates of discharge for each stream segment to provide an area estimate of stream habitat and reported habitat units in square meters. This results in a much more accurate depiction of habitat units within the streams as large streams are wider and likely hold more habitat than small streams but makes direct comparison of the 2013 and 2019 results incorrect.

4. Additional diversions were included in the model. The diversion to the Wailua Reservoir on the North Fork and the diversion to Upper Līhuʻe Ditch near the lower hydropower return on Waiahi Stream (South Fork) were included.

As a result, there were differences in the quantification of habitat availability between these two modeling efforts, but it was not primarily the result of different base data or modeling processes but rather an improvement in estimating habitat units as the modeling is improved over time. Thus, the underlying maps presented in the 2013 Upper and Lower Waiahi Hydropower HSHEP model and reproduced here are still valid as a graphic representation of the data (Figure 139 to Figure 146).

While the improvements to the HSHEP model have changed the specific amount of habitat units quantified in this version of the model compared to the past HSHEP model for the hydropower system, the overall pattern of impact native amphidromous species habitat is consistent between the two versions. The consistency between the results coupled with the broader range of field surveys completed for this project supports the overall conclusions of the impact of the Upper and Lower Waiahi Hydropower system on habitat for native amphidromous stream species.

For this study, we assessed the impact of the Upper and Lower Waiahi Hydropower diversions on native amphidromous species habitat units under four different scenarios.

1. No Diversion: This is the baseline comparison scenario where all diversions associated with the Upper and Lower Waiahi Hydropower System were modeled as closed with no water diversion and no impact on passage or entrainment of animals. This is the maximum available habitat units predicted.

2. Full Diversion: This is the scenario with all diversions modeled as fully open diverting 100% of available baseflow. This scenario represents the conditions found during water diversions under sugar cane production. This is the maximum impact on habitat units predicted.

3. Current Conditions: This scenario represents water releases at sluice gates based on CWRM staff recommended IIFS values but without any changes to the diversion structures. The water releases are made at the sluice gates on the ditches downstream of the diversion sites. As a result, impacts such as loss of habitat immediately downstream of the diversion, entrainment, and barrier effects were all considered as currently observed.

4. IIFS Flow Restoration: This scenario represents the flow conditions as recommended by CWRM staff and implementation of proposed modifications to the North Fork and Waikoko diversions to allow continuous water flow downstream at the point of diversion.

Scenarios 1 and 2 represent upper and lower boundary conditions for the HSHEP model and are not considered as management scenarios. Scenario 3 represents the current conditions as KIUC has implemented the IIFS recommendation through releases at the sluice gates on the ditch. Scenario 4 represents the conditions after a water lease has been secured and structural modifications to the diversions have been completed allowing the CWRM staff recommended IIFS to remain in the stream channel. When comparing among scenarios, the impact of the waterfalls, diversions downstream of the hydropower system, and predation impacts by smallmouth bass were all held unchanged, in order to quantify changes associated with the hydropower system and not other factors in the watershed. The following discussion considers some of the major results from the study.

1. The impact of the Upper and Lower Waiahi Hydropower diversions on native amphidromous species habitat units.

Non-climbing amphidromous stream species – These species included ʻoʻopu naniha (*Stenogobius hawaiiensis*), ʻoʻopu akupa (*Eleotris sandvicensis*), and ʻōpae oehaʻa (*Macrobrachium grandimanus*) and were expected to be restricted to stream segments below the first major waterfall and no differences in Habitat Units were predicted among scenarios. We observed ʻoʻopu naniha and ʻoʻopu akupa in the surveys below the waterfalls on both the North and South Fork of the Wailua River. Given the location of the diversion far inland from the lower reaches of the Wailua River, the diverted water returned to the streams inland of these reaches, and the overall large size of the lower Wailua river, it is unlikely that instream habitat is impacted by the Upper and Lower Waiahi Hydropower operations.

Climbing amphidromous stream species excluding ʻōpae kalaʻole (*Atyoida bisulcata*) – The climbing amphidromous animals were predicted to have most of their habitat located far downstream of the Upper and Lower Waiahi Hydropower facilities. ʻOʻopu nakea (*Awaous stamenius*), ʻoʻopu nōpili (*Sicyotperus stimpsoni*), ʻoʻopu alamoʻo (*Lentipes concolor*) and

hihiwai (*Neritina granosa)* are climbing species that can be found at relatively high elevations in steep streams. While these species have the ability to reach the elevations found near the Upper and Lower Waiahi Hydropower diversions, these species were not predicted to have much habitat due to the distance inland of these locations. ʻOʻopu nakea (*Awaous stamenius*) was predicted to have the most overall habitat units of any species within the Wailua River and the most habitat within the Upper and Lower Waiahi Hydropower diversions impact area of these species. We observed numerous ʻoʻopu nakea downstream of the major waterfalls on both the North and South Forks of the Wailua River but did not observed them at any location above the falls. We observed post-larval ʻoʻopu alamoʻo (*Lentipes concolor*) traveling upstream below the waterfall on the South Fork of the Wailua River. We did not observe either oʻopu nōpili (*Sicyotperus stimpsoni*) or *Neritina granosa* the surveys. Our results supported the conclusion that limited habitat exists in the Upper and Lower Waiahi Hydropower diversion impact areas even if the streams were undiverted, as downstream barriers and predation by smallmouth bass likely limit upstream populations for these species.

<u>ʻŌpae kalaʻole (*Atyoida bisulcata*)</u> - ʻŌpae kalaʻole (*Atyoida bisulcata*) was predicted to have the most habitat units in the area of the hydropower facilities. The past modeling work and this current update to the HSHEP model support this conclusion. Similar to the modeled prediction of suitable habitat being present in the Upper and Lower Waiahi Hydropower diversions impact area, our surveys showed robust populations of ʻōpae kalaʻole upstream of the North Fork, Waikoko, and Iliʻiliʻula Diversions. Additionally, we observed large numbers of ʻōpae kalaʻole within the diversion ditches and tunnels. Restoration of flow in the upper tributaries of the North and South Forks of the Wailua River should primarily benefit ʻōpae kalaʻole.

<u>Endangered Newcomb's snail</u> - We actively looked for Newcomb's snail during our biotic surveys, but none were observed. The critical habitat for the species is located upstream of the North Fork diversion on North Fork Wailua River (USFWS, 2006). A survey at the headwaters of the North Fork Wailua River by the Nature Conservancy documented the presence of Newcomb's snail (email communication with CWRM). The habitat in which the snail was observed was in seeps on the near vertical cliffs at the back of the watershed (≈ 1 km upstream of the diversion location). This habitat is consistent with descriptions of the species suitable habitat (USFWS, 2006). We looked in seeps flowing into the streams wherever we came across them but did not observe any Newcomb's snails. U.S. Fish and Wildlife Service also surveyed the area near the North Fork diversion and did not observe Newcomb's snails. These surveys support the critical habitat designation upstream of the diversion and that the seeps lower in the watershed are not suitable habitat for the species. If Newcomb's snails use the main channel as suitable habitat, the establishment of the CWRM staff recommended IIFS will positively affect the suitability of the main channel for the species. Thus, under the current conditions scenario there does not appear to be an impact on Newcomb's snail habitat by the hydropower diversions.

2. The location of the Upper and Lower Waiahi Hydropower diversion at the backend of the watershed decreases its impact on native amphidromous stream animals.

From the past HSHEP model for the Upper and Lower Waiahi Hydropower we concluded that, except for ʻōpae kalaʻole (*Atyoida bisulcata*), the location of the hydropower facilities at the backend of the Wailua watershed limited its impact to native amphidromous species habitat. We found a similar pattern again with the updated results of the HSHEP model. On one hand, this result was to be expected, as much of the distributional information used in the HSHEP model had not changed and therefore the results should generally be the similar. On the other hand, the increased surveys throughout the system showed that ʻōpae kalaʻole was the primary native stream animal observed in the upper reaches of the stream systems as was predicted by the model.

Our surveys within the ditches and tunnels of the upper Iliʻiliʻula - North Wailua Ditch showed high densities of ʻōpae kalaʻole living in the ditches. We observed multiple size classes as well as gravid females within the ditches indicating that conditions are suitable for growth and reproduction. The ditches likely are serving as pathways for ʻōpae kalaʻole to move among streams in the upper watersheds.

We also observed Tahitian prawn, *Macrobrachium lar* and crayfish, *Procambarus clarkii* in the ditches and these species are likely using the diches to move among streams. We observed bullfrog tadpoles, guppies and green swordtails in the mouth of the tunnel between the Iliʻiliʻula diversion and Waikoko diversions suggesting that they may also move among streams through the diversions although it does not appear that they reside in the tunnels for long periods.

3. Waterfalls were barriers controlling native amphidromous stream animal distributions.

Large waterfalls on both the north and South Fork of the Wailua River likely limit the upstream distribution of many native stream animals. We observed numerous native species below these waterfalls yet except for ʻōpae kalaʻole: we did not observe any native amphidromous species above the falls. We even surveyed directly above the falls on the North Fork to see if native amphidromous species were found above the falls. Extensive high-quality habitat exists but we did not observe any native amphidromous stream animals. We did observe *Macrobrachium lar,* an introduced amphidromous stream animal, and numerous smallmouth bass, an introduced predatory fish, which confirms that instream habitat and water quality conditions are suitable for both fish and crustaceans. It is well known that the Wailua Falls on the South Fork is a large, undercut waterfall and undercut waterfalls limit upstream passage of native amphidromous fishes. We were not able to view Kaholalele Falls on the North Fork to see if it was also undercut, but it is possible that it also has a limited suitable climbing pathway for native amphidromous fishes. The lack of native fish above the falls may be the result of passage barriers at the waterfalls. If this is true, additional water restoration in the upper Wailua River tributary streams will not result in large increases of native amphidromous fishes due to their lack of ability to reach the restored stream segments.

4. Predation by smallmouth bass.

Smallmouth bass are a non-native predatory fish that were stocked into the Wailua River system by the Hawaiʻi Department of Game and Fish (precursor to the Division of Aquatic Resources)

in the 1960's for the development of a recreational fishery (DAR, 2009). In their native range, smallmouth bass are well-suited to living in small rivers and streams and feed primarily on small fish and crustaceans (Edwards, 1983). Predation on native amphidromous stream species by smallmouth bass likely limits native amphidromous stream species where smallmouth bass persist.

Smallmouth bass have not been stocked for many years in Hawaiʻi streams, but they appear well established in the Wailua River system. We observed smallmouth bass in many areas in both the North Fork and South Fork of the Wailua River. We observed them above and below the waterfalls. On the South Fork, smallmouth bass were common upstream to at least the Upper Waiahi hydropower discharge and middle reaches of Waikoko Stream. On the North Fork, we observed smallmouth bass up to the Stable Storm Ditch area. We observed all size classes of smallmouth bass confirming their continued growth and reproduction within the Wailua River system.

The presence of these large and relatively long-lived predatory basses suggests that water quality and habitat conditions are good throughout the North and South Fork. Smallmouth bass typically inhabit deeper pools than the native amphidromous gobies indicating that water quantity should have been sufficient for native fishes. We observed greater numbers of smallmouth bass in the South Fork as compared to the North Fork, although large adult individuals were observed in each fork. Differences in abundance of smallmouth bass between the South and North Forks may reflect fishing pressure. Much of the South Fork was on private property which may limit access, while much of the upper North Fork flowed through public land providing easier access to anglers. The differences in abundance is probably not a result of differences in habitat as there is extensive high-quality habitat in both river forks.

IIFS flow restoration as recommended by CWRM staff will improve instream habitat and water quality downstream of the diversion locations. This will improve habitat for most stream species and will likely benefit smallmouth bass as well. Thus, with the exception of the steep upper reaches predation by smallmouth bass may limit the return of native amphidromous fish to the north and south forks of the Wailua River.

Past study recommendations:

The 2014 study recommended actions that could decrease the impact of the Upper and Lower Waiahi Hydropower on native stream animal populations. Both recommendations appear to be addressed with the CWRM staff recommended IIFS and proposed modifications to the diversion structures. The recommendations in that study were:

1. Optimize the location and amount of water diverted and design permanent downstream water releases within the diversion system to maximize habitat and passage for ʻōpae kalaʻole (*Atyoida bisulcata*) while retaining current diversion quantities. The use of this HSHEP model for Wailua River would be an excellent resource to aid in the optimization of downstream releases by testing various water release scenarios.

2. Reduce entrainment of ʻōpae kalaʻole (*Atyoida bisulcata*) into the generation facilities to avoid mortality associated with passing through the turbines.

The implementation of the CWRM staff recommended IIFS will provide consistent water flow below the diversions and will increase suitable habitat, improve passage, and decrease entrainment for all species found in the vicinity of the diversions. The IIFS flow recommendations will also assure low flow in the stream continues even as modifications to the diversions will reduce water leakage from the diversion that currently provides small amounts of water downstream of the diversions. The intentional IIFS releases at the diversion will more appropriately protect instream habitat rather than relying on system leakage. Additionally, reducing system leakage will allow the diverted water to be more efficiently used within the hydropower system while minimizing overall impact.

To reliably deliver the consistent IIFS flow release, KIUC is planning to modify the diversions to allow IIFS release under all flow conditions at the point of diversion. Currently, some diverted water reaches the hydropower system and some is released back to the stream channel through sluice gates on the ditch downstream of the North Fork and Waikoko diversions. Modifications to the diversions to allow water passage at the diversion will reduce entrainment into the system to only water intended to pass through the hydropower system. While it is clear that ʻōpae kalaʻole (*Atyoida bisulcata*) can live within the ditches of the hydropower system, improved stream habitat and passage past the diversions will decrease the number of individuals passing through the hydropower turbines. We modeled both scenarios and showed improvement in overall habitat units with the diversion modifications implemented as proposed.

Overall, the combination of consistent water flowing downstream at the point of diversion will improve instream habitat, improve passage by eliminating the dry streambed below the diversion, and decrease entrainment within the ditch system as compared to the current diversion design and operation. These changes were predicted to result in an increase in suitable habitat units and decrease the impact of the hydropower on native amphidromous stream species. The improvements associated with the implementation of the IIFS at the point of diversion and diversion modifications may not result in dramatic increases in native amphidromous stream animal populations, as downstream barriers and the presence of the predatory smallmouth bass appear to limit the suitability of habitat in both the North and South Fork of the Wailua River.

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APPENDIX E
Update to 2017 Cultural Impact Assessment

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Draft

Cultural Impact Assessment for Kaua‘i Island Utility Cooperative Blue Hole Diversion Long-Term Lease Project, Wailua and Hanamā‘ulu Ahupua‘a, Līhu‘e District, Kaua‘i TMKs: Multiple

Prepared for
Kaua‘i Island Utility Cooperative

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Management Summary

Reference	Cultural Impact Assessment for Kaua‘i Island Utility Cooperative Blue Hole Diversion Long-Term Lease Project, Wailua and Hanamā‘ulu Ahupua‘a, Līhu‘e District, Kaua‘i, TMKs: Multiple (Ishihara et al. 2019)
Date	May 2019
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAILUA 35A
Agencies	Office of Hawaiian Affairs (OHA) and the Board of Land and Natural Resources (BLNR)
Land Jurisdiction	State of Hawai‘i
Project Proponent	Kaua‘i Island Utilities Cooperative (KIUC) and the Office of Hawaiian Affairs (OHA)
Project Location	Waikoko Stream and the North Fork of the Wailua River (“Blue Hole Diversion”)
Project Description	The KIUC applied for a 65-year lease to use water emanating from state lands and collect water from Waikoko Stream and the North Fork of the Wailua River (referred to as “Blue Hole Diversion”) for the purpose of continuing to operate two of KIUC’s hydroelectric plants. In 2006, a Memorandum of Agreement (MOA) between KIUC and OHA was issued with the condition that a cultural impact study be conducted for the issuance of the long-term lease. The MOA states that OHA may object—based on the cultural impact assessment (CIA)—to the BLNR issuance of a long-term lease. The purpose of the study for the MOA is to detect if there are any cultural practices occurring within the project area and determine whether or not the proposed activity will affect these practices.
Document Purpose	This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and consultation this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties that may be assessed as significant under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations

	with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6).
Results of Background Research	Background research for this study yielded the following results, presented in approximate chronological order: 1. Hanamā‘ulu and Wailua Ahupua‘a comprise a large system of freshwater resources. According to Wichman, Wai‘ale‘ale is the main source for several streams including Wai‘ahi and Wai‘aka (Wichman 1998:60). These streams eventually feed into Kapaia Reservoir and Hanamā‘ulu Stream, which empties into Hanamā‘ulu Bay. 2. The most popular and literal translation of Wailua is “two waters” (Pukui et al. 1974:224), supposedly referring to the two main forks (north and south) that comprise the Wailua River. Lyle Dickey writes, “This explanation never seems to occur to a native Hawaiian” (1917:15). Another meaning is “water pit,” referring to the pools at the bottom of several waterfalls along the river’s course (Damon 1931:360). According to Pukui and Elbert (1986:379), the term “wailua” means “spirit, ghost; remains of the dead,” and also refers to “an ancient variety of sweet potato presumably introduced from Wailua, Kaua‘i.” Kamakau (1976:7) attributes the name of Wailua Ahupua‘a as most likely derived from the fourteenth century high chief Wailuanuiaho‘āno, born in ‘Ewa, O‘ahu, and whose descendants went to Kaua‘i and to Maui, calling the land where they settled after the name of their ancestor. “Wailua was a song of La‘akona, ancestor of the ‘Ewa family by Ka-ho‘ano-o-Kalani. His name, Wailuanui-a-Ho‘ano, came from adding the name of his mother” (Kamakau 1976:7). The main source that feeds the river is Mount Wai‘ale‘ale. The *mauka* (toward the mountain) waterfalls, Kapakanui and Kapakaiki, literally refer to “big” and “little raindrop” (Pukui et al. 1974:187). Streams of the North Fork of Wailua River include Kawi, Uhau ‘iole, and Keāhua. Streams of the South Fork of the river include ‘Ili‘ili‘ula and Hāli‘i. Ōpaeka‘a (“rolling shrimp”; Pukui et al. 1974:171) Stream is also a tributary of the Wailua River but enters in the ocean-tidal influenced section approximately 0.6 miles from the river mouth. It does not contribute any water to taro growing areas in the watershed of the Wailua River. Instead water diverted from Ōpaeka‘a Stream contributes to taro growing areas to the north of the Wailua watershed including the formerly extensive swampy areas north through Olohena into Kapa‘a along with Konohiki

	Stream and other smaller unnamed streams; the former swamp is now drained by manmade Moikeha, Waikaea, and Waipouli canals. 3. Hanamā‘ulu is home to Kalauokamanu Heiau which was a large walled *heiau* (pre-Christian place of worship) of *po‘okanaka*, sacrificial, class (Bennett 1931:125). In 1855, a large section of a wall was destroyed to make room for the sugar mill of the Lihue Plantation. 4. The *makai* portion of Wailua Ahupua‘a known as Wailua Nui Hoanu or Wailua Nui Lani was the political epicenter of Kaua‘i during ancient times. At least seven major *heiau* have been recorded in a relatively small portion of Wailua Ahupua‘a including Pōhaku‘ele‘ele Heiau, Hikinaakalā Heiau, Holoholokū Heiau, Pōhaku Ho‘ohānau, Malae Heiau, Poli‘ahu Heiau, and the Pōhaku kani Bellstone. The complex of *heiau* was declared a National Historic Landmark in 1962. 5. According to some *kama‘āina* (native born) of the area, Wailua was known as a *pu‘uhonua* or place of refuge (Smith 1955:15). *Pu‘uhonua* were places of peace and safety for transgressors and non-combatants in times of strife. Holoholokū Heiau is identified as such by historian John Papa ‘Ī‘ī (1959:138); Hikinaakalā Heiau by historian and author Frederick Wichman (1985:70). Judge Lyle A. Dickey (1917:15) maintains that Hauola was a *pu‘uhonua*. 6. The *ahupua‘a* of Hanamā‘ulu was purchased by Paul Isenberg, the manager of Lihue Plantation (Damon 1931:742–747). By 1870, the plantation owned 17,000 acres of undeveloped land in Hanamā‘ulu. Albert Spencer Wilcox started the first sugarcane plantation in Hanamā‘ulu called the Hanamaulu Plantation (Dorrance and Morgan 2000:28). A mill was erected in 1877, and a railroad was constructed to connect the fields to the mill. In 1898, Hanamaulu Plantation merged into Lihue Plantation. Hanamaulu Mill operated until 1920 and was later converted into housing for workers. 7. A personal narrative written by Jeffrey Agader (2004), who grew up in Hanamā‘ulu during the 1950s, depicts the cultural and historical background of the *ahupua‘a* with nuanced recollections. 8. The Lihue Plantation Company used gravity flow irrigation for its sugar growing operation. On closing, the irrigation system contained over 30 miles of ditches and tunnels and many reservoirs collecting water from streams across the Wailua, Hanamā‘ulu and Kapa‘a watersheds. In 1998, with the collapse of the sugar industry, plantation irrigation systems were abandoned

	and left to deteriorate. (Department of Agriculture 2003:12). Today, private businesses and farmers are advocating for the Department of Agriculture to take over management of the irrigation system as the life blood of a new diversified agriculture industry taking the place of the sugar plantations (Department of Agriculture 2003:12). 9. The state is working on balancing the economic needs for the stream waters and the life and health of the stream with ongoing cultural practices including, but not limited to, maintaining traditional ponded fields for taro farming, pig hunting, forest plant collection, and ceremonial use of stream and forest locales.
Results of Community Consultation	CSH attempted to contact Native Hawaiian Organizations (NHOs), agencies, and community members. Consultation, referrals, or personal testimony was received from the following community members: 1. Ted Blake, *kama‘āina* 2. Josephine Bonaparet, *kama‘āina* 3. Nicole Hoku Cody, *kama‘āina* and marine biologist 4. Felicia Alongi Cowden, radio host and educator 5. Kyle Gilmore, *kama‘āina* 6. Kamealoha Hanohano-Smith, *kama‘āina,* cultural practitioner and Wailua Representative for the ‘Aha Moku Council 7. Debbie Jackson, *kalo* (taro; *Colocasia esculenta*) farmer and *kama‘āina* on *kuleana* (Native land rights) lands 8. Hope Kallai, cultural practitioner 9. John Ka‘ohelauli‘i, *kama‘āina* and cultural practitioner 10. Michael Leibbrandt, *kama‘āina* 11. Noa Mau-Espirito, *kama‘āina*, cultural practitioner, occupying the former Coco Palms Hotel 12. Kanoa Mayer, resident of Olohena 13. Beverly Muraoka, *kumu hula* (*hula* teacher), cultural practitioner, and former entertainer at Coco Palms Hotel 14. Katherine Muzik, teacher and researcher of coral and *limu* (general name for seaweed) 15. Puanani Rogers, Ho‘okipa Network, *kama‘āina*, *kupuna*, and Coordinator for the ‘Aha Moku Council 16. Ka‘ahiki Solis, Cultural Historian at the State Historic Preservation Division (SHPD) 17. Dr. Mehana Vaughan, *kama‘āina* and Associate Professor in the Department of Natural Resources and Environmental Management at the University of Hawai‘i at Mānoa 18. Koa Young, *kama‘āina* Consultation was reopened in November 2018 and the following people were interviewed:

	1. Danny Hashimoto, cultural practitioner and tour operator with KauaiQuest Adventures 2. Sabra Kauka, cultural practitioner and *kumu* (teacher)
Non-Cultural Community Concerns and Recommendations	Based on information gathered from the community consultation and personal testimonies submitted, participants voiced the following concerns not related to the cultural context. 1. Josephine Bonaparte and Puanani Rogers both feel the 65-year lease was too long. Ms. Bonaparte suggested a month-to-month revocable lease. 2. Hope Kallai is concerned about the existing dam and ditch's structure. She pointed out that the existing structure has holes and exposed rebar, which is a threat to public safety. 3. Participants expressed eagerness to review the previous contractor's CIA findings. Participants felt there should be more dialogue between the project proponent and the community in regards to planning and mitigation.
Cultural Community Concerns and Recommendations	Based on information gathered from the community consultation and personal testimonies submitted, participants voiced the following concerns related to the cultural context. 1. Many community members shared their concern for low flow to no flow of water and how it affects water ecosystems *mauka* to *makai* (seaward); surrounding vegetation gathered for cultural practices including for *lei* (garland) making and *‘ohe hano ihu*; and traditional subsistence gathering (*lo‘i kalo*; fresh water and salt water fish; fresh water limpets; frogs; crabs; *pepeiao* that grows on *hau*). a. Dr. Mehana Vaughan believes the drying of the North Fork should be addressed immediately. She suggested removing the existing dam as soon as possible and devising a replacement system where the diversion leaves more than half of the water in the stream, not taking more than 50% of the daily flow. She suggested lava rock (uncemented) be used. b. Many cited a Native Hawaiian practice of not taking 100% of the water from a waterway. Community members voiced the same concern for the *lo‘i* system, where water enters the *lo‘i* then placed back into the stream. Without water being rediverted, many organisms such as *‘ōpae*, *‘o‘opu*, *hīhīwai*, and other fresh and salt water aquaculture are unable to thrive or reproduce. 2. Several *kama‘āina* including Debbie Jackson, Kamealoha Hanohano-Smith, and Puanani Rogers expressed that the water from Wai‘ale‘ale is sacred and used for ceremonial practices.

	3. Many pointed out that *oli*, *mele*, and *hula* describe the mass quantity and sacredness of the *wai*. Interviewee Nicole Hoku Cody expressed that *hula* shares a story of Hawai‘i that is rapidly fading due to anthropogenic changes. However, when you are able to understand the *mo‘olelo* told through *hula*, the memory and integrity of a traditional environment kinship is still preserved. 4. A number of participants discussed the General Plan and cited Native Tenant Rights, International Law, the 1839 Declaration of Rights, the 1839 Law Respecting Water for Irrigation Water Rights, the 1840 Constitution, the 1850 Kuleana Act, the 1978 Hawai‘i State Constitution (Article XI, Section 7), the Commission on Water Resources Management (CWRM); several lawsuits regarding water rights (McBryde vs. Robinson; Waiahole Decision); and the Department of Hawaiian Home Lands (DHHL) in regards to planning and future beneficiaries. 5. Ms. Sabra Kauka expressed her concern that if the objective is to increase water flow into the original river bed, nearby invasive species need to be removed. Invasive species such as *Albizia* are a serious threat to native forests. *Albizia* displaces native plants by blocking sunlight with its extensive canopy and absorbing massive amounts of water, essentially starving other plants. 6. Mr. Danny Hashimoto echoed the same sentiments as Ms. Kauka. He suggested removing invasive species in the vicinity of the river bed to create a stronger flow of water. He also suggested removing boulders and other debris such as fallen trees (i.e., *Albizia* and mango) that disturb the flow. 7. Testimony on Senate Bill 223 SD2 in favor of the bill that “transfers operation authority over the portions of the East Kauai Irrigation System to the Department of Agriculture, establishes positions and makes appropriations.” The testimony includes comments from the Department of Agriculture, the East Kauai Water Users’ Cooperative, the Hawai‘i Farm Bureau, the Larry Jefts Farms, LLC, the Kalepa Kaolition, and the Saiva Siddhanta Church (refer to Appendix D Senate Bill No. 223 SD2 Relating to Irrigation). 8. The East Kauai Water Users’ Cooperative related that discussions to date regarding the KIUC application to divert water at Blue Hole and Waikoko Streams for power production fail to encompass the impact on existing irrigation systems on State Kalepa lands downstream of the power houses. No proposal being put forth ensures the continued operation of this system servicing hundreds of acres of prime agricultural land, and providing a supply of water to the adjacent DHHL lands. Mr. Jerry Ornellas, President of the East Kauai Water Users’

	Cooperative, in a 11 December 2018 letter to Board of Land and Natural Resources, related that, If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question-a key issue which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamaulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process. [refer to Appendix E]
Impacts and Actions	Based on information gathered from the cultural and historical background, potential impacts were identified, and the following preliminary actions are suggested or are being taken: 1. <u>Impact</u> Participants expressed their concern for low to no flow and the negative effects on water ecosystems *mauka* to *makai*; surrounding vegetation gathered for cultural practices; traditional subsistence gathering; and ceremonial purposes. <u>Proposed Actions</u> Community members suggested restoring at least half (50%) of the water back to the North Fork; continued interactive consultation with the community (*kama‘āina*, *kūpuna*, cultural practitioners, farmers and the KIUC) to achieve greater awareness of potential impacts on Hawaiian cultural beliefs, practices, and resources for long-term mitigation measures; biological and botanical data collection to determine appropriate release amounts for riparian flora and fauna health to balance with the need of agriculture. 2. <u>Impact</u> Participants expressed their concern regarding invasive species near the river banks. *Albizia* and other invasive species are a serious threat to native forests by displacing native plants and depleting surrounding, essential resources (such as water and sunlight) vital to health and growth. <u>Proposed Action</u>

	Participants recommended that the proper entities and landowners: a. Develop a scheduled vegetation clearing plan (e.g., cut down large and/or invasive trees such as *Albizia* and *Miconia*; remove other invasive plants such as *Clidemia hirta*) in the vicinity of and along the Wailua River bank to allow for maximum water flow and to prevent future blockages that may result in area flooding. b. Develop a scheduled maintenance plan in the vicinity of and along the Wailua River bank to prevent future blockages that may result in area flooding (e.g., debris such as tree branches, boulders, leaves, trash). 3. <u>Impact</u> Areas of taro farming are believed to be impacted due to water taken from the river at the diversion. <u>Action Taken</u> A pedestrian survey was conducted by CSH archaeologists along sections of the North Fork of Wailua River at and *makai* of the Blue Hole Diversion to check for potential taro growing areas (pre-Contact to present day). During the pedestrian survey, there was no evidence of terracing or relics of taro along the North Fork of the Wailua River. The river’s gradient at the elevation of the diversion project area and to *mauka* and approximately ½ mile *makai* is steep with few flood terraces of minimal size in the valley bottom. This natural geography of the area is a major factor in determining this location is not ideal or conducive to taro cultivation in terraced *lo‘i*. Māhele and previous archaeology documentation indicate habitation and associated taro cultivation was generally at and below approximately 800 ft elevation and on close to the Wailua River mouth and ocean shoreline. 4. <u>Impact</u> Although previous archaeological research did not indicate any burials or historic properties other than the ditch were found within or near the project area, project construction workers and all other personnel involved in the construction, maintenance, or any other relative activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. <u>Proposed Action</u> If *iwi kūpuna* (ancestral bones) are identified, all earth-moving activities in the area will stop, the area will be cordoned off, and

	the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. If *iwi kūpuna* and/or cultural finds are encountered, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance. If any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. 5. <u>Impact</u> Diversified agriculture occurring in the former sugar plantation cane lands will be severely impacted if the existing ditch systems and reservoirs are not maintained. The KIUC hydroelectric plants will be severely impacted if the existing ditch systems and reservoirs are not maintained. The cost of replacing the ditch water systems with another water delivery system is not cost effective. <u>Proposed Actions</u> 6. Find a balance of water distribution for stream and riparian biota health, and agricultural irrigation and hydroelectric energy production needs by placing the existing ditch under state Department of Agriculture management and maintenance.

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Section 1 Introduction

1.1 Project Background

At the request of the Kaua‘i Island Utility Cooperative (KIUC), Cultural Surveys Hawai‘i (CSH) has prepared this cultural impact assessment (CIA) for the KIUC Blue Hole Diversion Long-Term Lease, Wailua and Hanamā‘ulu Ahupua‘a, Līhu‘e District, Kaua‘i, multiple Tax Map Keys (TMKs). The project area is depicted on U.S. Geological Survey (USGS) topographic quadrangles (Figure 1 and Figure 2) and aerial imagery (Figure 3).

The KIUC applied for a 65-year lease to use water emanating from state lands and collected water from Waikoko Stream and the North Fork of the Wailua River (referred to as “Blue Hole Diversion”) for the purpose of continuing to operate two of KIUC’s hydroelectric plants.

In 2006, a Memorandum of Agreement (MOA) between KIUC and the Office of Hawaiian Affairs (OHA) was issued with the condition of a cultural component study be conducted for the issuance of the long-term lease. The MOA states that OHA may object—based on the results of the cultural impact study—to the Board of Land and Natural Resources (BLNR) issuance of a long-term lease. The purpose of the study for the MOA is to detect if there are any cultural practices occurring within the project area and determine whether the proposed activity will affect these practices.

1.2 Document Purpose

This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties that may be assessed as significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284.

1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports with the specific purpose of identifying

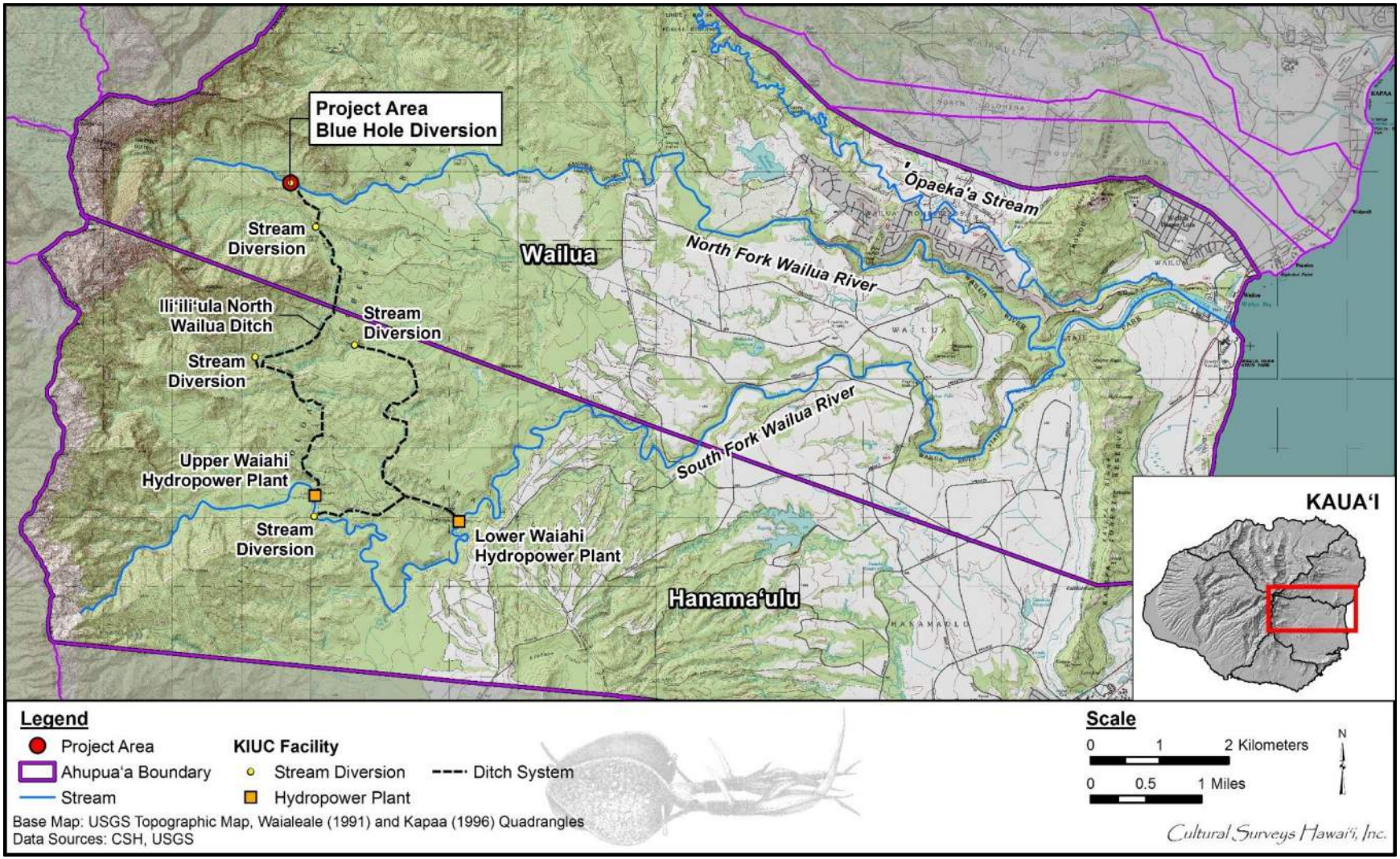

Figure 1. Portion of the 1991 Waialeale and Kapaa USGS 7.5-minute topographic quadrangles showing the location of the project area

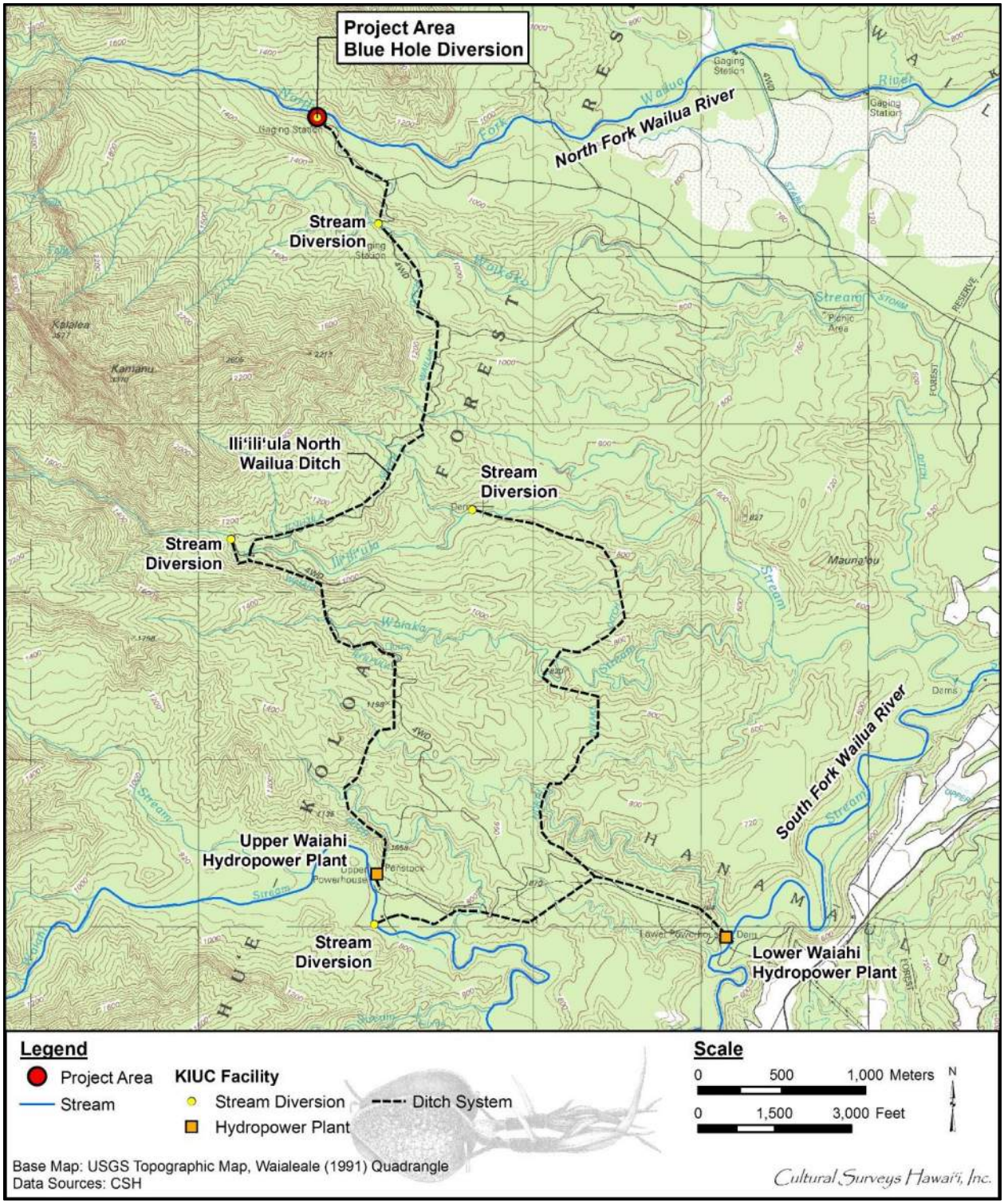

Figure 2. Close-up of the 1991 Waialeale USGS topographic quadrangle depicting the project area, streams, diversions, ditch systems, and hydroelectric power plants

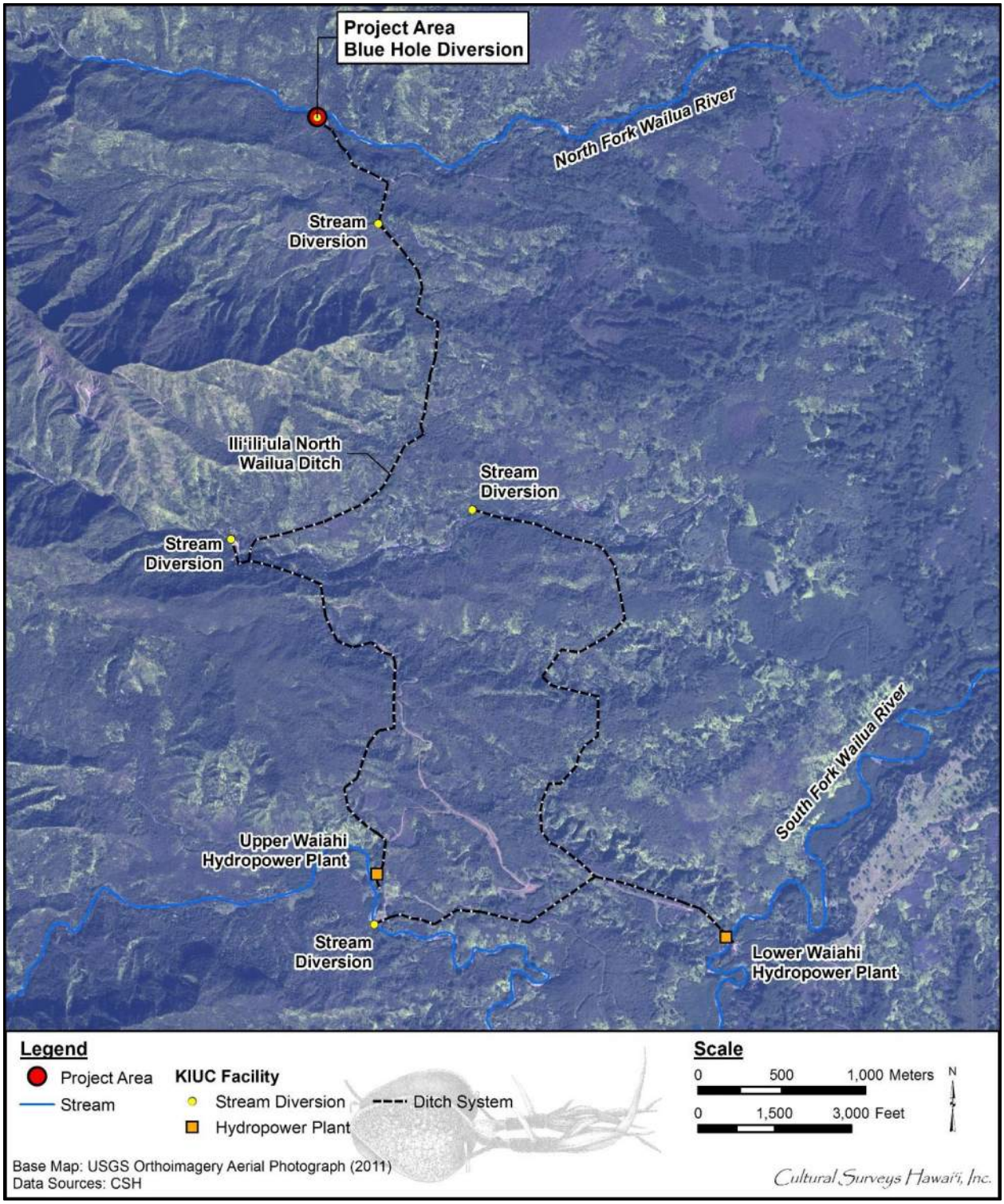

Figure 3. 2011 USGS Orthoimagery aerial photograph with project area

traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Natural Environment

The *ahupua‘a* (traditional land division extending from the mountains to the sea) of Wailua and Hanamā‘ulu are situated in the old *moku* (district) of Puna. Today, Wailua Ahupua‘a is divided or split geographically between two of Kaua‘i’s modern judicial districts. The boundary separating Kawaihau and Līhu‘e judicial districts follows along the north bank of the Wailua River from the ocean shoreline until just *mauka* (inland) of Nounou mountain; from there the boundary very closely follows the centerline of the river’s north fork, past the project area, to the summit of Kuaohukini where it meets the Hanalei and Waimea judicial district boundaries. This places the project area in the district of Līhu‘e along with Hanamā‘ulu Ahupua‘a. Wailua Ahupua‘a is the largest *ahupua‘a* in both district systems, totaling 20,255 acres. Stretching from the shoreline to its *mauka* extent at Wai‘ale‘ale (elevation 5,080 feet [ft]), the *ahupua‘a* encompasses most of the small streams and tributaries that flow into the Wailua River, the largest and singular navigable river in the State of Hawai‘i (Handy and Handy 1972:425).

1.4.1.1 Geology

Wailua is located on the eastern side of the island of Kaua‘i, partially exposed to the prevailing northeasterly tradewinds. The rainfall averages about 70 inches per year in the area behind the Nounou and Kālepa mountains to about 100 inches per year in more western (*mauka*) localities (Macdonald et al. 1960; Armstrong 1983:62). The whole *ahupua‘a* is situated in the Līhu‘e basin, a geologic feature of the island. This large, semicircular depression, 7 to 10 miles across, is bordered on the west by the central Kaua‘i mountain range, on the east by the Nonou and Kālepa mountains, on the north by Makaleha ridge, and on the south by Hā‘upu range. The basin was actually a caldera formed by the collapse of a large portion of the eastern flank of the main shield volcano that forms the island. This collapse probably occurred late in the Waimea Canyon volcanic series, which formed the original land mass of the island in the Pliocene period. During the second major volcanic series, the Koloa series (late Pliocene period), lava flowed over the entire floor of the basin except for Pu‘u Pilo, ‘A‘ahoaka hill, Kālepa and Nounou mountains, remnants of the Waimea Canyon series, which were high enough so as not to be totally buried and exist today as *kīpuka* (Macdonald and Abbott 1970:390). Two vents of the Koloa series near the vicinity of the project area are Kilohana Crater and Hanahanapuni cinder cone (Macdonald et al. 1960).

1.4.1.2 Soils and Drainage

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soils consist of Hulua gravelly silty clay loam, 25 to 70% slopes (HNUF) (Figure 4). Hulua Series are described as follows:

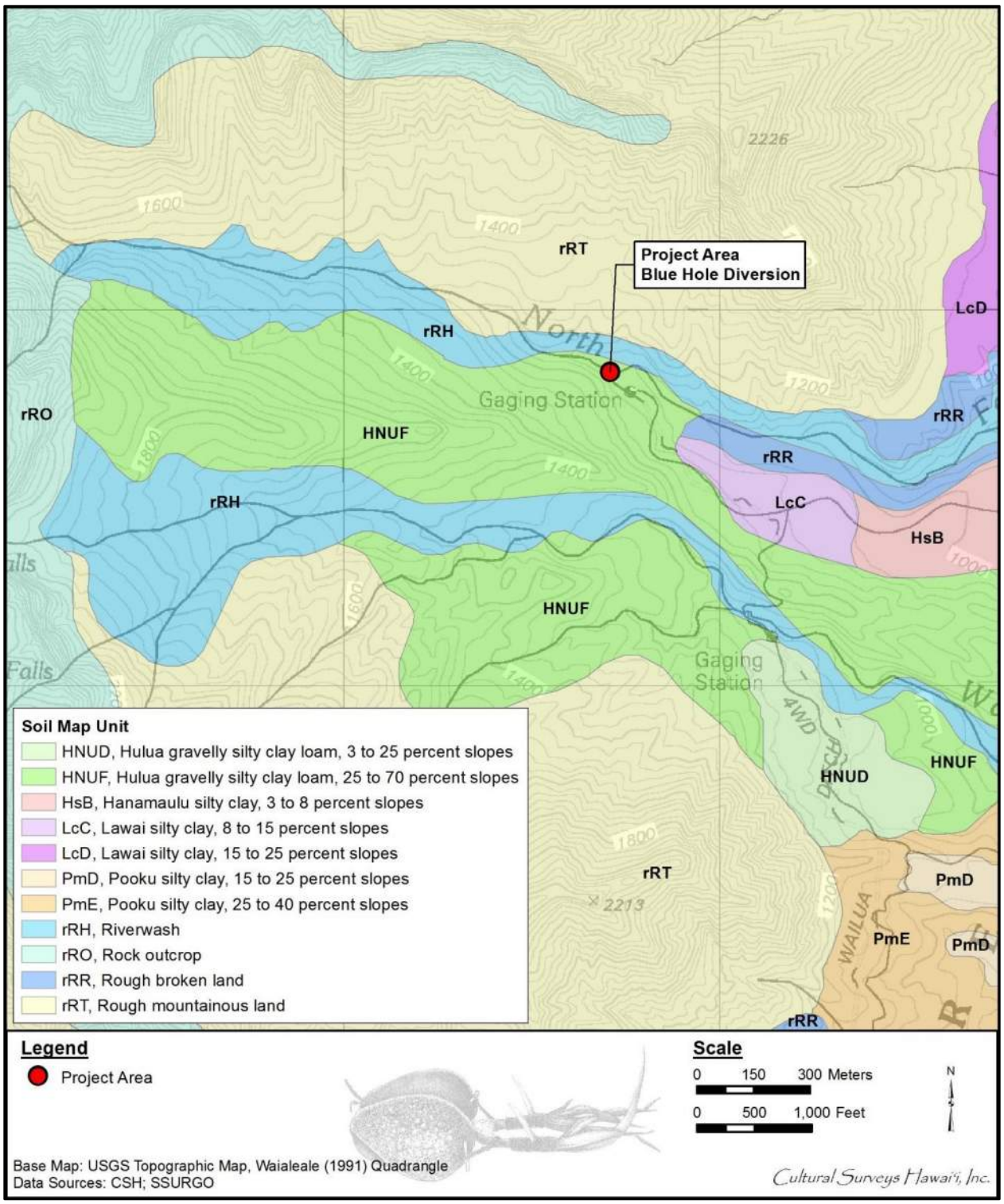

Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

> This series consists of poorly drained soils on uplands on the island of Kauai. These soils have a layer of indurated ironstone at depths of 10 to 20 inches. They developed in material weathered from basic igneous rock. They are gently sloping to very steep. Elevations range from 400 to 2,400 feet. The annual rainfall amounts to 100 to 200 inches. The mean annual soil temperature is 66° F. Hulua soils are geographically associated with Koolau and Halii soils.
>
> These soils are used for water supply and wildlife habitat. The natural vegetation consists of false staghorn fern (uluhe), scrub ohia, clubmoss, uku uki, hilograss, and associated plants. [Foote et al. 1972:45]

The 25 to 70% slopes of the Hulua gravelly silty clay loam soils at the ditch intake location within the project area result in a steeper gradient of the Wailua River’s north fork here, and is not considered an ideal geographical location for taro terraces because of that steep gradient.

The Wailua River and its tributaries comprise the major drainage system for the central area of the Līhu‘e basin. The north fork of the river has its source at the base of the central Kaua‘i mountains, below Wai‘ale‘ale, Kuaohukini, and Kawaikini. The major tributary streams flowing into the north fork are Uhau‘iole, Keiliua, Kawi, and Kalama, all originating from the north in the southwest portion of Makaleha mountain ridge.

The south fork, into which the water from the project area is returned, is formed by the convergence of several small streams at the western edge of the basin south of Kawaikini. These are Palikea, Ka‘ulu, Waikoko, ‘Ili‘ili‘ula, Wai‘aka, ‘Iole, Hāli‘i, and Wai‘ahi. The north and south forks of the Wailua River meet just west of the gap between the ridges of Nounou and Kālepa, just *mauka* of the boundary of Wailuanuiho‘ānu or “great, sacred Wailua,” a place *kapu* (sacred, taboo) to the *maka‘āinana* (native born) (Dickey1916). From this junction to the sea, a distance of almost 2 miles, the river is tidal-affected and navigable by small craft.

‘Opaeka‘a Stream, a major tributary to the tidal section of the Wailua River and often (confusingly) referred to as the “north fork,” empties into the Wailua River below the 200 ft elevation contour, well below the north (or middle) and south fork confluence. ‘Opaeka‘a is the source of fresh water into Debora Kupule’s fishpond and surrounding taro lands on the north side of the river. The pond at the former Coco Palms resort receives its fresh water from ‘Opaeka‘a and then drains via a ditch or *‘auwai* with *makaha* (sluice gate) into the tidal area of the Wailua River very near the ocean

1.4.2 Winds and Rains of Wailua

The Wailua River and its tributaries comprise the major drainage system for the central area of the Līhu‘e basin. The Līhu‘e basin is bound by the Hā‘upu Mountains to the south, Wai‘ale‘ale to the west, and the Makaleha Mountains to the north.

The proposed project area receives between 1,500 and 2,000 mm mean annual rainfall (Giambelluca et al. 1986). Vegetation within the project area includes Java plum (*Eugenia jambos)*, Christmas berry (*Schinus terebinthifolius)*, Albizia (*Albizia* sp.), and bird’s nest fern. The Makaleha Mountains lie to the north.

1.4.2.1 Wind

The *mo‘olelo* (story), *The Wind Gourd of La‘amaomao*, describes the various winds throughout the Hawaiian Islands. The following passage describes the winds of Kaua‘i traveling from north to west, south, and east:

> Waiolohia is of Nahanahanai,
> Inuwai is of Waipouli,
> Ho‘olua is the wind of Makaīwa [Nakuina 1992:53]

1.4.2.2 Rains

The rain associated with Wailua is known as *mokihana*, also the name of a native tree on Kaua‘i and its fruits. The passage below describes the *mokihana* rain:

> *I Wailua ko‘u hoa luhi e uē nei i Halehuki ē*
> *Pulu ka ‘uhane i ka ua Mokihana*
> *Ke wehe lā i ke oho o ke kāwelu ē*

> At Wailua my weary companion cries, at Halehuki
> The spirit is drenched in the Mokihana rain
> Opening up the leaves of the kāwelu grass [Akana and Gonzalez 2015:177]

1.4.3 Built Environment

The ecosystems of the Hawaiian Islands, developed over many millions of years, have experienced impact over the last two millennia, first by the arrival of people of the oceanic cultures of Polynesia bringing sophisticated horticulture and domestic animal culture and fishing. A millennium later the global movement of peoples of the western and eastern continental cultures arrived bringing all things continental.

1.4.3.1 Pre-Contact Hawaiian Development in Wailua

Irrigation Ditches and Horticulture

‘Auwai or irrigation ditches were an integral part of the development of ponded field systems on the flood plains of Hawai‘i’s rivers including the Wailua River. Several *‘auwai* are located along North and South Forks of the Wailua River documented by Land Commission Awards (LCA) of the Kuleana Act of 1850 (refer to Section 4; Figure 9). *‘Auwai* surveyed during archaeological studies in these areas along the North and South Forks are earthen ditches with or without rock lining built at the base of the valley walls to divert water from the river to the terraced ponded fields on the alluvial flood terraces associated primarily with taro cultivation.

In the post-Contact period when continental cultures were becoming dominant in Hawai‘i, rice often replaced taro in the pond fields with flumes added to expand the irrigation system during the period of rice production (Hammatt 1989). The importance of diverting water from the rivers and streams for sustaining agriculture is documented in the *kuleana* claims. In the Wailua claims alone over a dozen *‘auwai* or ditches are mentioned as boundaries of *kuleana* lands (Hammatt et al. 1997).

1.4.3.2 Post-Contact Sugar Plantation Development in Wailua

1.4.3.2.1 The Lihue Plantation

The Lihue Plantation was begun in 1849 and its first land purchase was 3.00 acres in the *ahupua‘a of* Nāwiliwili, becoming the Lihue Plantation Company in 1859. The owners, H.A. Pierce and later William Harrison Rice, Judge William Little, and Charles Reed Bishop, added 300 acres at Ahukini in Hanamā‘ulu in 1866 making it a port and constructing the first pier on Hanamā‘ulu Bay of concrete block, built at Kou on the north side of the bay in 1890. Rowboats carried freight and passengers between this pier and inter-island steamers anchored offshore. (Garden Island 2008). The plantation bought between 2,000 and 3,000 acres of land between Nāwiliwili Stream to the south and Hanamā’ulu Stream to the north; the original plantation encompassed a good-sized section of today’s town of Līhu‘e. In 1878, 30,000 acres were leased at Wailua. The Lihue Plantation Company early on encircled Nāwiliwili Bay and extended *mauka* to the slopes of Kilohana volcano. The Lihue Plantation Company built the Hanamā‘ulu Mill for grinding cane in 1877 and it and the surrounding houses came to be called Hanamaulu Plantation. In 1898, the Hanamaulu Plantation Company lands and its small railroad were added to the Lihue Plantation to increase the holdings some 9,000 acres (Condé and Best 1973:165) extending north to the south bank of the Wailua River. In 1934, the Makee Sugar Company, whose southern extent was the north bank of the Wailua River, became part of the Lihue Plantation Company (Condé and Best 1973:167).

1.4.3.2.2 Irrigated Agriculture

Early nineteenth century sugar plantation irrigation efforts did not differ remarkably in scale or technology from traditional Hawaiian practices, although their purpose was to irrigate fields cleared and planted with sugar on the ridge tops rather than on alluvial terraces within the valleys.

Lihue Plantation’s cane land was irrigated by gravity flow. William Hyde Rice, founder of Lihue plantation, pioneered modern sugar irrigation when he built the Rice Ditch on Kaua‘i. It was opened on 16 August 1856, one of the landmarks in the history of Hawai‘i’s sugar plantations. Starting at Hanamā‘ulu Stream, it proceeded southward toward Līhu‘e Town through a gap in Kilohana crater for about 10 miles being 2.5 ft wide by 2.5 ft deep. To make it watertight, “the men tramped it all over to make the bottom hard.” The main difference between the Hawaiian *‘auwai* and the early sugar ditches was that now water was not returned to the stream and in fact was transferred for the first time out of its watershed (Wilcox 1996:54). In 1870, a new and improved ditch was built, the Hanamaulu Ditch. By 1910, the irrigation system of Lihue Plantation Company had grown to contain 33 miles of ditches, 4 miles of tunnels, and 9,900 ft of water bearing flumes. There were 3,517 acres of cane harvested that year, producing 14,765 tons of sugar and a wharf and warehouse at Ahukini provided shipping and storage facilities for the sugar. Reservoirs were also developed as part of the irrigation systems; the largest being the Wailua with a 242-million-gallon capacity; its water is drawn from the North Fork of the Wailua River. By the time Lihue Plantation acquired Makee Plantation, it had 7,200 acres in cane with another 2,200 acres planted by independent planters, primarily homesteaders. It had a well-developed water collection and delivery system, too, which delivered an average of some 30 mgd and included Anahola, Kaneha, and Kapaa ditches. Altogether it had a total reservoir capacity of 700 million gallons (Wilcox 1996:73). Many other irrigation projects were engineered and built by the Lihue Plantation Company. The Kapahi Tunnel and the Makaleha system were built between 1922 and 1926. In 1926, the Waiahi-Iliiliula–North Wailua ditches were built to bring water from the North

Fork to the South Fork at the 1,000 foot elevation. The intake at the Wailua River for this latter ditch is often referred to today as the Blue Hole, the focal point of this report for the renewal of leases to continue water diversion.

The general landscape surrounding the Blue Hole water diversion ditch project area is predominantly steep, undeveloped forested land consisting of typical native and naturalized plant colonies. The diversion features include a dam across the river, which creates a large pool at the dam, allowing water to be diverted from the pool into the ditch; the ditch intake is on the south bank and proceeds south from Wailua into Hanamā‘ulu Ahupua‘a. The diverted water becomes available to a complex system of irrigation ditches constructed over the past 150 years by the developing sugar plantation economy in Hawai‘i. Today the water from the Blue Hole diversion is used specifically in hydroelectric power generation and then released into the the South Fork of the Wailua River. Water in the larger system of ditches is used for ranching and other agriculture production since the plantation closed in 1968.

1.4.3.2.3 Lihue Plantation and East Kauai Water Company (EKW).

Lihue Plantation developed a water collection system second only to East Maui Irrigation Company. Two entities administered this water system: East Kauai Water Company and Lihue Plantation Company. Altogether there are 51 miles of ditch and 18 intakes. The system brings down anywhere from 80 to 180 mgd, with an average of 100 to 140 mgd. In 1984, 11 people, seven from EKW and four from Lihue Plantation, were needed to maintain this system (Wilcox 1996: 67).

East Kauai Water Company (EKW) was established in 1924 with jurisdiction over all the water flows of the North Fork of the Wailua River, the Kapa’a and Anahola rivers and their tributaries, and including waters of Hanalei River and Kaapoko Stream diverted into the North Wailua drainage basin, a total length of 34 miles of ditch (the 101 tunnels in the system comprise 11 of the 34 miles). Lihue Plantation managed the rest of the system: the South and North Intake ditches, the Upper and Lower Lihue ditches, the Hanamaulu Ditch, the Kapaia Ditch, and the Waiahi-Iliiliula–North Wailua ditches (Wilcox 1996:68).

The Hawai‘i Department of Agriculture in its *Agriculture Water Use and Development Plan* (Department of Agriculture 2003:12) relates that “In 1998, with the collapse of the sugar industry from over 250,000 acres to less than 50,000 acres in production, plantation irrigation systems were abandoned and left to deteriorate.” The lack of maintenance on the irrigation infrastructure resulted in significant impact to the system elements. “By the late 1990s, government economists, private businesses, and farmers were advocating the development of a new diversified agriculture industry to take the place of the large, corporate sugar plantations” (Department of Agriculture 2003:12).

The quest for sharing water for cultural practices, stream health, and irrigation for farmers and ranchers of the new diversified agriculture industry is continuing today.

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele* (songs), traditional *mo‘olelo*, traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau.org 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s *Māhele* database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

2.2 Community Consultation

2.2.1 Scoping for Participants

The cultural department commences our consultation efforts by utilizing our previous community contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kama‘āina* (native born), cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. CSH also contacts agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response to the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.2.2 “Talk Story” Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *‘ike* (knowledge) and *mana‘o* (thought, opinion) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g., sit down and *kūkā* [consultation, discussion] in the participant’s place of choice over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, CSH also conducts group interviews, which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on

interviewees’ answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist the cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) adding missing details to *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance in identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua‘a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana* [storied places], archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka‘ao* and *mo‘olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

2.2.3 Interview Completion

After an interview, CSH cultural researchers create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the interview summary to the interviewee for review and ask that they make any necessary edits. Once the interviewee has made those edits, CSH incorporates their *‘ike* and *mana‘o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant’s interview summary, and any photos taken during the interview. We also include a thank you card and honoraria.

It is important that CSH cultural researchers cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *‘ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *‘ohana* and community.

“*I ulu no ka lālā i ke kumu*—the branches grow because of the trunk,” is an *‘ōlelo no‘eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: “Without our ancestors we would not be here” (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other community contacts if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our *kūpuna* who have passed on and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference. All field activities are performed in a manner so as to minimize impact to the natural and cultural environment in the project area. Where appropriate, Hawaiian protocol may be used before going on to the study area and may include the *ho‘okupu* (offering) of *pule* (blessing), and *oli*. All participants on field visits are asked to respect the integrity of natural and cultural features of the landscape and not remove any cultural artifacts or other resources from the area.

Section 3 *Ka‘ao* and *Mo‘olelo* (Legends and Stories)

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka‘ao* are often full of *kaona* or double meanings.

Ka‘ao are defined by Pukui and Elbert as a "legend, tale […], romance, [and/or], fiction" (1986:108). *Ka‘ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been "consciously composed to tickle the fancy rather than to inform the mind as to supposed events" (Beckwith 1970:1). Conversely, Pukui and Elbert (1986:254) define *mo‘olelo* as a "story, tale, myth, history, [and/or] tradition." The *mo‘olelo* are generally traditional stories about the gods, historic figures or stories that cover historic events and locate the events with known places. *Mo‘olelo* are often intimately connected to a tangible place or space (*wahi pana).*

In differentiating *ka‘ao* and *mo‘olelo* it may be useful to think of *ka‘ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* (gods) in a primordial time. *Mo‘olelo* on the otherhand, reference a host of characters from *ali‘i* (royalty), to *akua* (gods) and *kupua* (supernatural beings), to finally *maka‘āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, "In reality, the distinction between *ka‘ao* as fiction and *mo‘olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact" (Beckwith 1970:1). Thus a so-called *mo‘olelo*, which may be enlivened by fantastic adventures of *kupua*, "nevertheless corresponds with the Hawaiian view of the relation between nature and man" (Beckwith 1970:1).

Both *ka‘ao* and *mo‘olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama‘āina* as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the project area. Many relate an age of mythical characters whose epic adventures inadvertently lead to the Hawaiian race of *ali‘i* (chief) and *maka‘āinana*. The *ka‘ao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived; they still speak to the characteristics and environment of the area and its people.

3.1 Mo‘olelo of Hanamā‘ulu and Wailua Ahupua‘a

3.1.1 Kawelo

In Abraham Fornander's *Legend of Kawelo* (1919:5[1]:2–59), the great cultural hero of Kaua‘i was born in Hanamā‘ulu but his grandparents soon moved with him to Wailua. Kawelo was brought up with two relatives, ‘Aikanaka, the son of the ruling chief of Kaua‘i, and the giant Kauahoa, another cultural hero associated with Hanalei. Kawelo was a great eater and had such a voracious appetite that his grandparents grew weary and to induce him to leave the house they made him a canoe. After many adventures on O‘ahu, Kawelo learned that his parents were being

ill-treated on Kaua‘i by ‘Aikanaka. Kawelo returned to Wailua on a double canoe. Kawelo chanted as follows:

E Kamalama iki kuu pokii,	Say little Kamalama, my younger brother,
I Wailua ka ihu o na waa e	Point the bow of the canoe towards Wailua,
I Wailua, e	Yes, towards Wailua. [Fornander 1918:5(1):32]

When Kamalama heard the orders of Kawelo, he pointed the bow of the canoes toward Wailua. They then continued on to Wailua and anchored just below the village (Fornander 1918:5[1]:32). It seems to be an important point to the story that Kawelo refuses to first stop and see his parents and friends at Hanamā‘ulu but rather goes to straight to Wailua and war with ‘Aikanaka (Rice 1923:74).

The fighting begins at Wailua. ‘Aikanaka directs the Kaua‘i forces from Nounou Ridge, sometimes described as a *heiau* (pre-Christian place of worship) but more typically described as a fortified redoubt for his forces (Rice 1923:74–82). Kawelo succeeds in defeating Kauahoa and ‘Aikanaka and rules Kaua‘i from his home in Hanamā‘ulu.

Fornander provides a different retelling in *A Story of Kawelo* (Fornander 1919:5[3]:694–721), Here, Kawelo’s birthplace is given as Waimea, Kaua‘i and many other details of his relations and tribulations also differ from Fornander’s earlier account. A common factor, however, is that Kawelo on O‘ahu learns that ‘Aikanaka is mistreating his parents and he sails for Wailua where he engages the forces of his enemy. Pukui’s (1951:111) account is much the same, with Kawelo returning to aid his parents and announcing, “We go at once to meet the men of ‘Aikanaka. Steer for Wailua.”

Thorpe’s (1924:157) account of “Kawelo or the Lei of His Parents” is also much the same, mentioning that Kawelo’s grandparents carried the little *keiki* (child) with them when they moved to Wailua.

W.D. Westervelt (1963:173; see also Thrum 1923:149), in his account of “Kawelo,” relates that Kawelo, ‘Aikanaka, and Kauahoa were all born the same day and were taken to Wailua as infants where they were brought up near each other. Again Kawelo’s return to save his parents has him landing at Wailua where the fighting begins (Westervelt’s 1963:183).

The chant *Mele Ahiahi* (Evening Song) is a remembrance of Kawelo at Wailua:

> *He ahiahi kapu no Kawelo*
> *I holoholo ku iloko Wailuanui-a-hoano*
>
> Sacred is the evening of Kawelo,
> Who traveled about Wailuanui-a-hoano [Fornander 1920:4(3):418–419]

The following *ka‘ao* describes Kawelo and his love for his family:

> Maihuna and Malai-aka-lani have five children in Hanamaulu on Kauai: Kawelo mahamahaia, Kawelo-lei-ko‘o, Kawelo-lei-makua (the subject of the story), and Kawelo-kamalama, all sons, and Kaena-ku-aka-lani, a daughter. The maternal grandparents bring up Kawelo at Wailua with Ai-kanaka (Man-eater), son of the ruling chief, and Kaua-hoa (Battle comrade), all relatives born on the same day. Kawelo eats enormously and angers his fellows by outdoing Kauahoa in managing

> toy boats and kite flying. The place where he worsted Kauahoa in the latter sport is called to this day Ka-ho‘oleina-a-pe‘a (The kite caused to fall).
>
> When the family move to Oahu, he angers his brothers by outdoing them in wrestling and they leave him and return to Kaua‘i. Kawelo remains in Hanamaulu, becomes proficient in fishing, and fishes up the Uhumakaikai by means of a chant. When summoned to Kauai to avenge his family he sends his wife Kane-wahine-iki-aohe to obtain from her father the stroke called Wahieloa to prepare him for fighting. He bathes in the stream Apuakehau [in Waikīkī, O‘ahu] and gets a good meal of food. He sends Kamalama to spy upon the conversation of his wife's relatives and they believe him to be a god. At Waianae he builds a temple to his god Kane-i-ka-pualena and to the god Ka-lani-hehu which the messengers have brought him from Kauai. The chief of Oahu furnishes him with a canoe. An adopted son, Ka-ulu-iki, gets frightened at the start and returns to Oahu. The story of the subjugation of Aikanaka and his subsequent attack with stones does not vary essentially from Green's version. Aikanaka goes to live in the uplands of Hanapepe and it is this chief's daughter whom Ka-ele-ha makes his wife and to whom he reveals Kawelo's weak point. Kawelo retires eventually to his parents' old home at Hanamaulu. [Beckwith 1970:407–408]

3.1.2 Nounou (Sleeping Giant) Mountain Range

The Nounou Mountain range was understood as the fortress of ‘Aikanaka from which he waged warfare against Kawelo. Dickey (1917:24) relates that in their final battle: “Aikanaka had collected there a large number of stones and a terrific battle with stones followed and therefore the hill has been called ‘Nounou,’ or stone battle, from that day to this.” Pukui et al. (1974:167) also relate the name (literally “throwing”) to the last stand of the tyrant ‘Aikanaka.

The landform's popular name “Sleeping Giant” would appear to have been traditionally particularly associated with ‘Aikanaka's gigantic warrior Kauahoa in the Kawelo tradition (Figure 5). Wichman summarizes two very different traditions for the Sleeping Giant given below.

> One legend of the Sleeping Giant says his name was Puni. While he was sleeping a fleet of war canoes from O‘ahu attacked. Puni‘s friends, the Menehune, tried to wake him up. They prodded him and poked him to no avail. Finally they threw huge rocks on his stomach, which bounced off and landed in the sea near the war canoes. The O‘ahu fleet turned and sailed back home. The following morning the Menehune came to wake Puni up—but they could not. He was dead, for several rocks they had thrown during the night had fallen into his mouth as he snored and choked him to death. [Wichman 1985:75–76]
>
> Another legend tells of a giant named Nunui. Wherever he stepped, he created a deep hole that the villagers planted with bananas. Nunui was very gentle and was popular with everyone. When the ruling chief wanted to gather rocks from upper Wailua and ‘ōhi‘a lehua logs from the high mountains, Nunui got them all and helped build the heiau Kukui, which is noted for the incredibly large stones used in its walls. After a huge feast, Nunui was tired and lay down to rest. He is still sleeping there and may wake up any day. [Rice 1923:10]

Figure 5. Photo of Nounou Mountain Range (right background) with Wailua River emptying into the ocean (center), ca. 1924 (U.S. Army Archive)

3.1.3 Kaumuali‘i at Wailua

Kaumuali‘i, the ruling chief of Kaua‘i, is said to have often lived at Wailua although historic records seem to associate him more with his home at Papa‘ena‘ena, Waimea, Kaua‘i. Smith (1955:20) places Kaumuali‘i’s place of Wailua residence on the north bank of the river within the area known as Wailua Nui a Ho‘āno and associates him with the “King’s Highway” or “King’s path.” The name “King’s Highway” is used for both the Wailua River itself (Smith 1955:20, 25) and the parallel approximate alignment of the present Kuamo‘o Road on the north bank (Smith 1955:27).

A reference to Wailua is given in the “Kaumuali‘i Chant” by Kapaekukui (Fornander 1920:4[3]481–482):

E pi‘i ana Wailua i o Maunakapu	Ascending from Wailua to Maunakapu
Ka ‘āina o Kawelomahamahaia	The land of Kawelomahamahaia.

3.1.4 Palila’s Tattooing

Dickey relates that on the Kamahualele ridge that separates the two northern branches of the Wailua River (understood to be just east of Poli‘ahu Heiau) is a place called “Kaelialina-a-ka-mahu:”

> . . . where Palila, a famous warrior of Kaua‘i, was tattooed. One stone marks where his head lay and one his body during the tattooing. He had been asked by the king of O‘ahu to help him in battle and by the advice of his astrologer had himself tattooed so as to be disguised. [Dickey 1917:29]

It appears there were distinctive tattoo traditions for Kaua‘i warriors. Wichman adds to Dickey’s account:

> Palila, having helped his father overcome the Kona [Kaua‘i] army and establish a truce, received a request for help from an O‘ahu chief. The chief’s messenger suggested that Palila disguise himself. In order to do so, Palila had himself tattooed. He stretched out on the ridge Kamāhū‘alele, ‘homosexual messenger,’ at Ka‘eli‘elinoaakamāhū, ‘profound freeing of the taboo of the homosexual.’ . . . Palila led the O‘ahu troops to victory and eventually became the ali‘i nui of Hilo on Hawai‘i. [Wichman 1985:74]

3.1.5 Mō‘īkeha

A famous ruling chief, Mō‘īkeha (dates to ca. AD 1340–1360 by the 20 years per generation count), according to a dominant tradition, was an O‘ahu chief who sailed off to Kahiki and on his return settled in Wailua, Kaua‘i, where the Puna family of chiefs welcomed him. Dickey (1917:24) relates that Mō‘īkeha planted the first taro and sweet potatoes of Kaua‘i “just north of the present cocoanut grove just off of the government road at Wailua.” “On the death of Puna, Mō‘īkeha became the *ali‘i nui* (high chief) of Kaua‘i, and remained there the balance of his life” (Fornander 1996:54). A variant tradition has Mō‘īkeha sailing from Tahiti with 36 double canoes looking for new land and landing at the mouth of the Wailua River in an initial colonization from the ancestral homeland (Smith 1955:11).

In the *History of Mō‘īkeha* (Fornander 1916:4[1]:116–129; see also Thrum 1923:21 and Wichman 1985:64) the ruling chief Mō‘īkeha is said to have originally come from Kahiki. Mō‘īkeha and his entourage including his *keiki ho‘okama* (foster son) Kamahualele, the two paddlers Kapahi and Moanaikaiaiwe, Kipunuiaiakamau and his companion, and the two spies Kaukaukamunolea and his companion sailed their double canoe to Wailua. It was late in the evening when they arrived and they moored all night. At dawn the people saw this double canoe floating in the sea with the *kapu* sticks of a chief aboard. The people gathered in great numbers to go surf riding at the surf of Kamakaīwa. Among the surfers were the *kaikamahine ali‘i* (chiefly daughters) Ho‘oipokamalanai and Hinau‘u (or Hina‘auluā). The young women quickly decided to take the handsome Mō‘īkeha as their man. Mō‘īkeha also fell in love with the girls and decided to take one of the girls to be his wife. But the feelings being mutual, Mō‘īkeha took both daughters of the sovereign and became *ali‘i nui* after the death of his father-in-law. He had five children with his two wives, all boys.

Fornander continues, saying a desire arose in Mō‘īkeha to see his son La‘amaikahiki, his child with his first wife Kapo. Mō‘īkeha devised a test to select one of his five Kaua‘i sons to go to Tahiti to fetch La‘amaikahiki. Each son, in order of their birth, was to attempt to sail a tī-leaf canoe (*wa‘a lā‘ī*) across the mouth of the stream (presumably the Wailua River) and between Mō‘īkeha's thighs on the opposite bank. Only Kila, the youngest, was successful and was chosen for the round trip to Tahiti. Kila was to be accompanied by six of Mō‘īkeha's trusted companions from his first arrival on Kaua‘i, Kamahualele, Kapahi, Moanaikaiaiwe, Kipunuiaiakamau and his companion, and Kaukaukamunolea. Three Kaua‘i people expressed their desire to go and the *kahuna* (priest) Wanahila brought the party up to eleven. Just as the star Sirius (*ka hōkū ho‘okelewa‘a*) was rising at dawn, Kila set sail with his first stop at O‘ahu to visit his paternal aunts. Mō‘īkeha's sister's inquired as to the well-being of their brother and Kila said he is living in Kaua‘i.

The search party found La‘amaikahiki and he dutifully agreed to return to Kaua‘i with them. La‘amaikahiki brought his *kahuna*, his *pahu* (drum; also called a *kā‘eke* which would appear to refer to large coconut-tree drums covered with sharkskin), and his god Lonoikaouali‘i. La‘amaikahiki and Kila returned to Mō‘īkeha on Kaua‘i where La‘amaikahiki resided for a while, before returning to Kahiki. Fornander relates the tradition that La‘amaikahiki was the first person who brought god images to Hawai‘i. This account suggests the worship of the deity Lonoikaouali‘i at a *heiau* of Wailua was started by La‘amaikahiki (Fornander 1916:4[1]:116–129).

Colum's account of Mō‘īkeha includes an English translation of the chant summing up Mō‘īkeha's last days, carrying the sentiment of the good life on Kaua‘i:

He is indulging in his ease in Kaua‘i,
Where the sun rises and sets again,
Where the surf of Makaīwa curves and bends,
Where the sun comes up over
The gauzy mists of Kewa;
He has the cool and calm shade of Kewa,
He has the stretched out waters of Wailua,
He has the entrancing favors of my mother,
Ho‘o-ipo.
He will live and die in Kaua‘i. [Colum 1925:8]

3.2 *Ka‘ao* of Hanamā‘ulu and Wailua Ahupua‘a

3.2.1 Puna

A *ka‘ao* recorded by Fornander (1996:45–56) and recently retold by Wichman (1998:54) describes the *‘āina* (land) and *kahawai* (river) of the Puna District on the island of Kaua‘i. After the initial contact, settlers began to populate Kaua‘i, searching for land to develop. They were able to find it in Puna.

> The ancient kingdom of Puna lies between the walls of Wai‘ale‘ale and the sea, cradled by the arms of the Hā‘upu Range on the south and the Makaleha Mountains to the north. This area is watered by three small rivers—Hulē‘ia, Hanamā‘ulu, and Ke‘ālia—that fed complexes of taro fields. The center of the land was also dominated by the watershed of the mighty Wailua River. It began in the countless waterfalls that cascade down an immense green amphitheater formed by three-thousand-foot cliffs. Small tributaries join to form large ones and these combine into large streams, the North and South Forks . . . The river becomes broad, deep, and slow, Hawai‘i’s longest navigable stream. It was the center of Kaua‘i’s second kingdom, Puna. [Wichman 1998:54]

3.2.2 Hihiakalahau (Hihiakalahu), the Place of the First *Hau* Tree

According to an old Hawaiian legend told by the Smith family of Wailua, the first *hau* (beach hibiscus; *Hibiscus tiliaceus*) tree was created along the banks of the Wailua River:

> It is just below the Poliahu Heiau up there on the hill. The legend says that there was a man long, long ago by the name of Hi-hi-aka-la-la-hau. He was a handsome man, very strong and in love with Princess Poliahu, the goddess of the Poliahu Heiau. She was a very powerful woman and according to the old stories, she could turn people into different forms or things. Even though she was a powerful person, this did not scare Hi-hi-aka-la-la-hau, as he wanted her to become his bride. She told him that if he would climb the cliff of Poliahu and reach the top before daybreak, she would be able to decide whether or not she would be his mate. He agreed to everything she said, so a time was set for him.
>
> The Princess picked a very dark night and at midnight Hi-hi-aka-la-la-hau started his climb up the cliff. But he did not get to the heiau on top by the time the sun rose, so Princess Poliahu turned Hi-hi-aka-la-la-hau into a tree. We now call this tree the hau tree, taking the last syllable of Hi-hi-aka-la-la-hau’s name.
>
> This hau tree grew to be a very large tree. Then there was a freak wind storm that came up with terrific force and blew the whole tree out of the ground and carried it up to the ridge of Mount Waialeale. There it put down its roots and grew again into a tremendous tree, even bigger than before. Then a big flash flood tore out this hau tree and broke it up in many pieces. The water carried these branches down the five main rivers of this island and out into the ocean and to the rest of the Hawaiian Islands. That is how the hau tree got started in Hawaii.

> The five main rivers on Kauai are the Hanalei River, the Kealia River, the Hanapepe River and Waimea River. That is why, when you pick up a hau leaf, you will find Mount Waialeale in the center and the five main rivers on the top. [Smith 1955:47]

In an archaeological surface survey of Wailua State Park, Hihiakalahau was considered as Feature 50 (Ching 1968:16). Located south of Poli‘ahu Heiau, it was described as “the place where the first hau trees of Kauai grew.” According to the survey, the place was named after a man who started to climb Poliahu Heiau at night but failed to reach the top before daylight and turned into a *hau* tree (Dickey 1917:30).

3.2.3 Hi‘iakaikapoliopele

Hi‘iakaikapoliopele (“Hi‘iaka-in-the-bosom-of-Pele” also known as “Hi‘iaka”) was sent by her elder sister Pele, the fiery volcano goddess, to fetch Pele’s lover Lohi‘au from Hā‘ena (located on the north shore of Kaua‘i) and bring him back to Kīlauea on Hawai‘i Island. Hi‘iaka was joined by Pā‘ūopala‘ā, an attendant to Pele and her sisters, and Wahine‘ōma‘o, a friend she met along the way to Kaua‘i (Ho‘oulumāhiehie 2008a:33–39).

As the three women sail to Kaua‘i, Wahine‘ōma‘o sees a mountaintop from afar. Hi‘iaka tells her friend it is the top of Wai‘ale‘ale. Hi‘iaka then begins to chant:

> Steep is the mountain the calm
> Wai‘ale‘ale rises there, at Wailua
> Pulled up heavenward is the bridge of Anokawailani
> Blocked from view by Nounou Hill
> Kaipuha‘a disappears completely
> Low-lying in its expanse
> Shallow is the gourd, low-lying at the shore of Kapa‘a
> Shallow is the gourd, low-lying in the uplands of Kapa‘a
> Do not restrain the voice
> Leaving no beckoning call of welcome. [Ho‘oulumāhiehie 2008b:167]

3.2.4 The Shark God of Wailua

One of the most popular traditions of Wailua is that of a certain shark-man deity whose name is variously spelled as “Kawelu” (Knudsen 1946:83), “Kawalo” (Smith 1955:67), and “Kauela” (Wichman 1985:72). Told by the Smith family, the story of the shark-man of Wailua, Kaua‘i follows:

> Further up the left fork of the Wailua River, are some old Hawaiian burial caves. There are seven in all, but only two can be seen from the river. Just about a hundred feet from these burial caves are two large rocks. One is on the hillside about fifty feet from the riverbank and the other is in the middle part of the river. When the tide is very low and the water is clear, this rock in the water can be seen very clearly. There are three stones all together, one on land, one in the water and one at the mouth of the Wailua River near Lydgate Park. The rock on land can be seen at all times from a boat. This rock is called the Shark Stone and is shaped like a pup tent.
>
> The people say that there was a man by the name of Kawalo who used to live on the left fork of the Wailua River. He could hear quite a distance away when any

canoes were coming down the river. As the sound of the canoe got closer, he would go to the riverbank and call out, ‘Good morning, where are you going?’ The people would say, ‘We are going fishing.’ Then Kawalo would say, ‘The weather is good and I hope you have good luck.’ Very happily they would paddle on down the river and out to the big blue ocean to fish, think that their fishing would be very good that day. But instead, something would happen, some them would get hurt or bitten by a shark, and fishing would be very bad that day. The men would go home very unhappy.

A few days later some other men wanted to go fishing, so they got in their canoes and paddled down the river. When they got close to Kawalo’s place, they could see him on the riverbank waiting to greet them. They could hear him call out, ‘Good morning, where are you going?’ The men in the canoes would answer, ‘We are going Holo Holo or going visiting.’ And then Kawalo would say no more and go back to work in his taro patch. Then these men would paddle down the river, but instead of going Holo Holo, they would go fishing and their luck would be very good. After they were through fishing, they would paddle back home very fast and very happy because their luck had been so good. In fact, they had so many fish that they made a Luau or a feast to celebrate their good luck.

While the Luau was going on, the first group of men who went fishing who had such bad luck, became suspicious and said to their friends that they thought Kawalo was some kind of god. Whenever he asked them if they were going fishing and they said yes, they had bad luck. So this first group of men planned to go fishing again, but this time they decided to get one of the men from their village to watch Kawalo while they were gone. This man was to come down along the riverbank and hide behind a very large rock close to Kawalo’s house, and, if at any time he noticed Kawalo doing anything suspicious, the man was to warn the fishermen.

So down the river paddled the men and when they got close to Kawalo’s home they could again see him standing and waving to them. He called out the same as before, ‘Good morning, where are you going?’ The men said, that they were going fishing, knowing that they had a man watching Kawalo. Kawalo wished the men good luck on their fishing and they again said, ‘Mahalo’ and they went on down the river to the ocean.

As soon as their canoes were out of sight, Kawalo looked around and then left his taro patch and went over to the riverbank. Before jumping into the river, he looked all around again to see if anyone was watching him. Seeing no one, Kawalo dove into the river. As soon as Kawalo dove into the river, the man who had been hiding behind the big rock watching him came running out to see what Kawalo was doing, but instead of seeing Kawalo, he saw a very large shark going down the stream. The man got excited and ran as fast as he could to the mouth of the Wailua River to warn the fishermen. He called and called, but the wind was so strong, it carried his voice away from the fishermen. They did not hear him calling, so the shark got his victims. The man that was supposed to warn the fishermen was worried and

> scared, and he was afraid to go back to his village because he thought he would be punished.
>
> However he did go back to the village and told his people what had happened. Then one of the older men called the whole village together so they could decide what to do. He said that from then on, never to tell anyone when they were going fishing. If anyone asked, they were to say they were going Awana, or going wandering, but never to say they were going fishing. The rock on the land was Kawalo's home while he was on land, and the one in the water, his home while in the river. The third rock at the mouth of the Wailua River was his home when he was out to sea. [Smith 1955:65–74]

3.2.5 Māui at Wailua

Some of the great feats of the pan-Polynesian demi-god Māui are said to have taken place at Wailua. It is said that when Māui tried to pull the islands together with his fishhook at Wailua Bay, seven of his *kapu* (taboo) breaking brothers were turned into stones at the mouth of the Wailua River (Dickey 1917:17; Wichman 1985:70–71).

Seemingly it was near the *pōhaku piko* (rock for storing umbilical cords) of Holoholokū Heiau that Māui first learned the secret of making fire from the mudhens and branded them with the red mark that species bears to this day (Dickey 1917:17–18). Wichman (1985:73) associates the place name "Papa‘alae" ("Plain of the mudhens") and the place name "Manu‘ena" ("red-hot bird") with this legendary event (presumably place names located in the vicinity of the *pōhaku piko*).

Beckwith presents a variation of Māui hooking the Hawaiian Islands together with the mudhens:

> If Maui can hook the fish Luehu on the night of Lono, he can draw the islands together. The nine alae birds (mud hens) give warning to Luehu of his approach. His mother teaches him to make an image in his place and himself hide and seize the youngest alae. The place where he catches the bird is shown in a taro patch near the navel stone of Holoholoku. [Beckwith 1970:232]

Māui catches Luehu and would have drawn the islands together, however, contrary to his mother's warning, he takes a bailer into his canoe which turns into a beautiful woman. A crowd has drawn and cheers Māui on, but Luehu slips off the hook and the islands disband.

Dickey relates that on both sides of the ridge separating the two northern branches of the Wailua River (near an area called Kamahualele, understood to be just east of Poli‘ahu Heiau) are marks of this demi-god:

> On the south side, in the water near the landing place of the present [1917] poi factory, is a stone called the fishing weight of Maui. To the north in the stream is a sharp stone, the canoe of Maui, also his fishhook Manaiakalani. The horizontal strata marks on the north side of the stream are marks made by the malo [loin cloth] of Maui when put there to dry after he had been out fishing. [Dickey 1917:29–30]

According to Dickey, Māui's home was just above the Waioloia waterfall (also called the ‘Ōpaeka‘a and Wailuaiki waterfall) and Maui's jawbone (Papaniho o Māui) "is a little below the top of the hill" (Dickey 1917:32).

Landforms associated with Māui are the brothers of a beauty named Māmāakualono. Māmāakualono refused to marry Hina's son Māui. Hina dammed up the entire south fork of the river causing the waters to rise almost to the cave where Māmāakualono lived (the popular "Fern Grotto"). When Māmāakualono jumped into the river to swim for her life, Hina removed the dam and Māmāakualono was swept out to sea. "She had three brothers, Niolopa‘a, Kōlea and ‘Uleli (‘Ulili) living above her who may still be seen there as stones" (Dickey 1917:33; Wichman 1985:77).

3.2.6 Menehune

In Padraic Colum's (1924:150) accounts of "The Me-ne-hu-ne" (legendary race of small people who worked at night, building fishponds, roads, temples), he notes a tradition that the Menehune were so numerous the males of this race "could form two rows reaching all the way from Makaweli to Wailua." Menehune are also associated with several *heiau* of Wailua. It is said that the Kaua‘i ruling chief Ola "sent the Menehunes to build a heiau at the mouth of the Wailua River, which was to be called Hauola, after the famous city of refuge of his father at Kekaha" (Rice 1923:56). Poli‘ahu Heiau has been attributed to Menehune construction (Rice 1923:120) as has Malae Heiau (Dickey 1917:25; Wichman 1985:68). A further account of the power of the Menehune at Wailua is related below in an account of "Nounou (Sleeping Giant) Mountain Range."

3.2.7 *Mo‘o* of Wailua

Mo‘o are defined as "Lizard, reptile of any kind, dragon, serpent; water spirit" (Pukui and Elbert 1986:253) and these fabulous creatures are often associated with fresh water. Hi‘iakaikapoliopele is said to have vanquished a *mo‘o* named Wailua while crossing the Wailua River (Emerson 1965:40; Wichman 1998:79–80).

At Pu‘u Kī ridge on the north side of the Wailua River (by Holoholokū and the Japanese cemetery) it is said that "a cave goes through the hill from north to south called Kaluamokila [Kaluamōkila]" that was both a place of refuge and the home of a resident *mo‘o* who could use the cave to access both land and river. (Dickey 1917:28). Dickey goes on to relate that regarding Kaluamōkila:

> After the reptile died the land entrance was choked up except for a small opening and the chiefs of Wailua would hide their families in this cave for safety in times of war, feeding them through the small hole. Kekai Hakulou, mother of King Kaumualii, was brought up in this cave, having been brought from Hilo in infancy. [Dickey 1917:29]

This tradition was reminiscent of patterns from elsewhere in Polynesia where high-ranking girl children would be raised in caves to make them more suitable wives and mothers.

Wichman (1985:73) provides the additional information regarding Kaluamōkila that, "One end of the cave was inside the heiau of Kaleiomanu and the other opened directly into the river. Now much of the cave is fallen in and it is very dangerous to go into it." Kaluamōkila, the *mo‘o* cave was designated by Ching (1968:13) as his Site 43 (State Inventory of Historic Places [SIHP] # 50-30-08-330).

Wichman also associates a *mo‘o* tradition with a portion of the river just upstream called "Ka-malu" ("the shade"):

> This was the home of a mo‘o chiefess who sometimes sat on the side of the pool as a beautiful young woman combing her long brown hair. She was the rock floating in the water. The other rock was her sister Pōhākū, ‘upright boulder,’ and had traveled as the float of an outrigger canoe from Kahiki and was borne up the Wailua River to this pool. [Wichman 1985:73–74]

This would appear to relate to the sibling rocks (see Kamalau and Kulai[na] below).

Wichman further relates an account of the defeat of the *mo‘o* Akuapehulani who worked for the *ali‘i* of Kona, Kaua‘i:

> The Wailua hero Kau‘ilani . . . conceived a method to defeat the dreadful dragon. He ordered a thick row of bamboo to be planted across the lower part of the [Wailua] valley and had a row of carved images set up behind that. When all was ready Kau‘ilani prayed to his gods and they entered the row of images, bringing them to life. He ordered the bamboo cut down, leaving each stump with a sharp pointed end. Then he went down to the sea and insulted the dragon until it was so outraged that it chased the young man back into the mountains. The dragon was charging so fast that it did not see the bamboo and impaled itself. [Wichman 1985:81]

In his discussion of the chant “Ko‘olau wind of Wailua” (*Ke Ko‘olau o Wailua*) Fornander (1920:6[3]:522–523) interprets the phrase *ka mokihi i ka wai* (“Mokihi of the stream”) as a reference to a large *mo‘o* of Wailua River.

3.2.8 Story of Pikoiakaalala

In the “Story of Pikoiakaalala” (Fornander 1917:4[3]:450–452; Dickey 1917:32) the hero was a member of a strange family that had the power to take on the form of humans or rats. Pikoiakaalala was born and raised at Wailua, Kaua‘i and one day he heard shouting for it was customary for the people to gather at Wailua to join in and witness the different athletic sports. His father informed Pikoiakaalala that the crowd was observing games such as *‘olohū* (disk rolling), *pahe‘e* (dart throwing), and *kō‘ie‘ie* (a game in which contestants vie at throwing boards in river rapids trying to make the boards float steady and not be carried downstream). Pikoiakaalala was successful at *kō‘ie‘ie* until he was swept down river and out to sea. Pikoiakaalala eventually washed ashore at Kou (Honolulu) on O‘ahu, and had various adventures most of which involved contests of shooting rats with small bows and arrows (Fornander 1917:4[3]:450–452).

Colum’s (1924:69–79; 1937:97–103) and Knudsen’s (1946:30) accounts of this hero (named Pi-ko-i in their versions) are very similar and appear to be largely derived from the Fornander source.

3.2.9 The Pu‘uhonua or Place of Refuge at Wailua

Wailua (particularly coastal Wailua) was known as a *pu‘uhonua* or place of refuge (Smith 1955:15). *Pu‘uhonua* were places of peace and safety for transgressors and non-combatants in times of strife. John Papa ‘Ī‘ī (1959: 138) identifies Holoholokū as a *pu‘uhonua,* a place “to which one who had killed could run swiftly and be saved.” Wichman (1985:70) asserts that the *pu‘uhonua* was at Hikina-a-ka-lā while Dickey (1917:15) maintains the *pu‘uhonua* was actually at neighboring Hauola.

3.2.10 Wailua Nui Ho‘āno (Wailua Nui a Ho‘āno)

Traditionally, Wailua was conceptually divided into parts with “Wailua Nui Ho‘āno” (“Great Sacred Wailua”) the name of a marked or sacred area associated with the *ali‘i*. As described by Wichman (1985:63), “Punanuikaia‘āina, leader of the settlers from the Marquesas, placed a *kapu* on the land on either side of the river from the sea to the top of the range that divides the shore from the uplands. This area was named Wailua Nui a Ho‘āno.” Wichman noted, “Punanuikaia‘āina himself seems to have been borne this name and there is confusion as to whether Wailua Nui a Ho‘āno is the name of a particular chief, or of the land only, or both” (Wichman 1985:179).

There are traditions that residence at Wailua was restricted by status with Wailua Nui a Ho‘āno “a land taboo to the common people” (Dickey 1917:14). As Smith (1955:26) relates, “in the old days of the early Hawaiians, the common people used to live way up in the valley and hills and the ali‘i down here in the lower part of Wailua.” The area restricted to the residence of *ali‘i* is understood as Wailua Nui a Ho‘āno.

3.3 *Wahi Pana* (Legendary or Storied Place)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Often dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo‘olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana [supernatural or divine power], and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings [McGregor 1996:22].

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands and reefs, or they can refer to Hawaiian land divisions such as *ahupua‘a* or *‘ili* (land section within an *ahupua‘a*), and man-made structures such as fishponds. In this way, the *wahi pana* of Hanamā‘ulu and Wailua tangibly link the *kama‘āina* of these *ahupua‘a* to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* or even certain individuals within an *‘ohana*, and many have been lost, forgotten or kept secret through time. Place names also convey *kaona* and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (ditches), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rocks, stones), *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana*

“physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v).

3.3.1 Hanamā‘ulu

Hanamā‘ulu Ahupua‘a is located in the district of Līhu‘e. Hanamā‘ulu literally translates to “tired (as from walking) bay” as translated by Pukui (Pukui et al. 1974:41). Hanamā‘ulu was a term “used to describe the many extra miles a traveler needed to walk in order to get to this location; travelers would often arrive with sore feet” (Wichman 1998:61). Hanamā‘ulu was also the name of a village (Pukui et al. 1974). The *ahupua‘a* of Hanamā‘ulu occupies a narrow section of Kaua‘i that is nestled on the southeast side of the island.

The first distinctive landscape feature is Kilohana Crater (“vantage point”) to the west reaching an elevation of 1,143 ft (USGS 1965). Ka‘ili‘iliahinale (“pebble stone of the clear fire”) is the northernmost peak within this *ahupua‘a*. Ka‘ili‘iliahinale refers to the markers used in the game *kōnane*, a form of checkers in which one player used white stones and the other either black or red stones. This peak may have been a source for the red pebbles (Wichman 1998:62–63). Kālepa (“to flutter”) is the third peak in the *ahupua‘a* (Wichman 1998:61).

The upper slopes of Kilohana Crater are the *maka* (source) of several streams. Waiahi (“fiery water”) and Waiaka (“reflection water” or “laughing water”) are two streams that originate at elevations of 2,500 ft and 1,640 ft, respectively (Soehren 2002:182–183). These waters are considered *kupua* (Wichman 1998:60) and flow into Kapaia Reservoir, eventually feeding into Hanamā‘ulu Stream (also called Kapaia Stream [Soehren 2002]) and pouring into the ocean at Hanamā‘ulu Beach Park.

The name Ahukini (“altar [for] many [blessings]” [Pukui et al. 1974:6]) is associated with several locations in Hanamā‘ulu. The name of a white sand coastal beach also known as Kalapakī, Ahukini lies across the bay from Nāpali‘o‘oma-o-Hanamā‘ulu. It is also the name of a landing (Pukui et al. 1974:6) referenced in the *mo‘olelo* of a brother of Pele who arrived there after helping to bring Lohi‘au back to life (Rice 1977:14). Finally, Ahukini probably refers to a *heiau* which formerly stood in Kalapakī near Ahukini Point (south of Ahukini Landing) on a bluff overlooking the sea. The *heiau* was likely named for Ahukini-a-la‘a, one of the three sons of La‘amaikahiki, the ancestor of the Kaua‘i chiefly lines. Ahukini-a-la‘a, lived about AD 1250 (Wichman 1998:61), and became the *ali‘i nui* of the Puna district (Wichman 2003:39).

Kalauokamanu Heiau was a large walled *heiau* of *po‘okanaka* (sacrificial) class (Site 103; Bennett 1931:125). According to Wichman:

> At the foot of Kalepa there was a large heiau, Ka-lau-o-ka-manu, ‘tip of the endpiece of the canoe.’ It was greatly feared because of the many human sacrifices that were made there. The stench from the heiau was so bad that travelers would hurry holding their noses. This was a large walled temple that was destroyed in 1855 to make the foundation for the Hanamā‘ulu sugar mill.
>
> Beside it are two stones whose story remains but whose names are lost. Chief ‘U‘u-kani-pō was betrothed to Ka-lau-o-kamani, a chiefess of Hanamā‘ulu and, with a friend, Ka-ipo-lei-manu, came to see her. They were walking down the path toward Kalepa from Kilohana Crater when they were accosted by a woman. The chief recognized his betrothed, Kalauokamani. ‘Turn back!’ she said. ‘Do not go near

> Kalauokamanu. Go toward the mountains. There you will find my sister, Moepaki‘i. It is she you must marry.’ ‘U‘u-kani-pō realized that she was seeing the ghost of his beloved and determined to find out what had happened to her. Ignoring her warnings, the two hurried toward the village. When they came near Kalauokamanu, the stench was so strong that the two men were overcome and turned into rocks that guard the path, warning all travelers of the danger ahead. [Wichman 1998:62]

3.3.2 Wailua

The largest river in the archipelago, was proverbial for its waters, as in the saying, “Ka wai hālau o Wailua” (“the expansive waters of Wailua”) (Pukui 1983:178). Several meanings of the name “Wailua” have been given, with the most popular meaning also the most literal: “two waters,” supposedly referring to the two main forks (north and south) that flow together to form the Wailua River. However, as Lyle Dickey writes, “this explanation never seems to occur to a native Hawaiian” (1917:15). Another meaning is “water pit,” referring to the pools at the bottom of several waterfalls along the river’s course (Damon 1931:360). According to Pukui and Elbert (1986:379), the term “wailua” means “spirit, ghost; remains of the dead,” and also refers to “an ancient variety of sweet potato presumably introduced from Wailua, Kaua‘i.” But the name of Wailua Ahupua‘a was most likely derived from the fourteenth-century high chief Wailuanuiaho‘āno as described by Kamakau:

> Wailuanui-a-Ho‘ano was born in ‘Ewa, Oahu, and his descendants went to Kauai and to Maui, and wherever they settled they called the land after the name of their ancestor. Wailua was a song of La‘akona, ancestor of the ‘Ewa family by Ka-ho‘ano-o-Kalani. His name, Wailuanui-a-Ho‘ano, came from adding the name of his mother. [Kamakau 1976:7]

Makaīwa is an ancient surf site associated with the voyager Mō‘īkeha, who landed nearby at Wailua. The name Makaīwa literally means “Mother-of-pearl eyes, as in an image, especially of the god Lono” (Pukui et al. 1986:226). The north end of Wailua Beach was another popular surf site, best known today as Horner’s. This site was named after Albert Horner, the manager of Hawaiian Canneries Company from 1920 to 1953, who built a 20-room residence inshore of the surf spot. In 1976, the landmark house was purchased by the Ventura family, who disassembled and rebuilt the structure near ‘Opaeka‘a Falls. In its place at Wailua Beach, the Venturas built the condominium Lae Nani, but the name Horner’s persists at this surf spot.

The mouth of the Wailua River can be found between Lydgate State Park and Wailua Beach (Figure 6). The river is one of the few navigable rivers in the state. One story of the origin of the Wailua River relates that the giant Kauaho fled from the hero Kawelo to Hanalei “where he lay down and so backed up the waters of the Hanalei river that they broke through the mountain and flowed down to Wailua” (Dickey 1917:23). Another story of the damming of waters is that an ancient chief had the waters of the Wailua River dammed at the location of a whirlpool, half a mile above Wai‘ehu Falls where he wished to have an *‘awa* (kava; *Piper methysticum*) feast (Dickey 1917:35). After the feast the river was returned to its course. The tannin-rich waters of the Wailua have invited speculation regarding the source of the water’s color. A tradition of Waikoko-o-Hina (“the blood-water of Hina”), a place above Wai‘ehu Falls, relates that Hokau

Figure 6. Photo of Wailua River mouth, n.d. (courtesy of Friends of Coco Palms)

had injured Hina, causing her blood to flow down the river, making it red and giving it its bloody name. At Kalua the redness of the river stops because of taboo (Dickey 1917:35).

Wai‘ehu (“spraying water”) is the ancient name for the large waterfall located on the south branch of the Wailua River. In recent years, the falls are commonly referred to as Wailua Falls (Figure 7). It is said that Kaumuali‘i, the last king of Kaua‘i, would jump over the falls and into the lower pool for sport (also called *lele kawa* or cliff diving). Today *lele kawa* would be considered dangerous due to half the former water flow being diverted for irrigation (Wichman 1998:79).

Just above the falls was a row of large rocks that spanned from one end of the river to the other (Wichman 1998:79). The large rocks were used as stepping stones. Before there were rocks, a *mo‘o* named Wailua lived next to the river. A wooden plank crossed to the other bank. Travelers would pay a toll to cross the river, however, if Wailua felt cheated, she would shake the plank when the traveler reached the middle and dump him or her over the falls. Pele’s sister, Hi‘iaka, came to this crossing while traveling to Hā‘ena to fetch Lohi‘au for her (see Section 3.5). Hi‘iaka asked the *mo‘o* to toss the plank across the river. At first the *mo‘o* refused, but later gave in. As Hi‘iaka reached the halfway point, the *mo‘o* began to shake the plank violently. Hi‘iaka regained her footing and killed the *mo‘o*. Hi‘iaka then threw large rocks across the river so others could pass safely (Wichman 1998:80).

The mountainous portion of the *ahupua‘a* is dominated by Mount Wai‘ale‘ale. Wai‘ale‘ale literally refers to “rippling water or overflowing water” (Pukui et al. 1974:220). The *mauka* waterfalls, Kapakanui and Kapakaiki, literally refer to the “big” and the “little raindrop” (Pukui et al. 1974:87).

‘Ōpaeka‘a Stream, which flows into tidewater Wailua River, once watered many terraces (Handy and Handy 1972:425). ‘Ōpaeka‘a refers to the stream and waterfall of the same name and literally means, “rolling shrimp” (Pukui et al. 1974:171). Handy and Handy (1972:425) provide names for a number of the streams and falls that form the headwaters of the North Fork of the Wailua River. The literal definitions for the names are Kawi (“To press, wring out, squeeze out, as fruit juice” [Pukui and Elbert 1986:140]); Uhau‘iole (“rat-hitting” [Pukui et al.1972:214]); and Keāhua (“the mound” [Pukui et al.1974:100]). A number of streams formed the headwaters of the South Fork of the river such as ‘Ili‘ili‘ula (“red pebbles” [Pukui et al.1974:56]) and Hāli‘i (“strewn” [Pukui et al.1974:39]).

Kālepa, the ridge that overlooks the flatland to the sea, is also the name of a forest reserve and trail and literally means “trade” (Pukui et al.1974:76). Pu‘u Pilo, meaning, “hill [of the] swampy odor or pilo plant” is a *kīpuka*, a term which refers to “an ‘island’ of land (where there may be greenery) left surrounded by a lava flow” (Pukui et al.1974:3) or, more generally, a calm place in a high sea, the opening in a forest or a clear place or oasis in a lava field (Pukui and Elbert 1986:155).

Mauna Kapu is a prominent landform on the south side of the Wailua River Valley. An imaginary line from Mauna Kapu to Nounou Mountain is said to demarcate Wailua Nui a Hō‘ano. The naming of Mauna Kapu (“sacred mountain” [Pukui et al. 1974:148]) is said to be associated with the legend of Kamalau and Kulaina, the brother and sister who were said to have been killed

Figure 7. Photo of Wailua Falls ca. 1941 (courtesy of Hawai‘i State Archives)

and transformed into rocks in the vicinity (Smith 1955:52–54). Wichman (1985:63) notes that Niolopua, the god of sleep, lived on its slopes.

There are numerous accounts of storied caves at Wailua. For some caves, names are remembered and for others the names appear to have been lost or are only known through association with legendary characters. Some of the most famous caves are Anahulu and Hauma caves in Wailua Valley where the brother and sister Kamalau and Kulaina stayed, respectively, on their way to loot Poli‘ahu Heiau (Dickey 1917:30); Kaluamōkila, a cave at Pu‘u Kī associated with a *mo‘o* and the mother of Kaumuali‘i; Kauela, the underwater cave where, according to Wichman (1998:72), the shark Kauela "used to live in a cave near the mouth of the river . . . [t]he present-day cement bridge was built over it and Kauela has had to find a new home"; Kawelowai (Keanao Kawelowai), located behind Wai‘ehu or Wailua Falls, a cave reached by swimmers using a weighted rope (Dickey 1917:23) and where Wailua chiefesses hid in times of war (Wichman 1998:79); Keoniewa, a cave where the giant Kauahoa Kame‘eui spent the night when he went to visit the ruling chief ‘Aikanaka in the Nounou Mountains (Dickey 1917:23); and Māmā‘akualono, the home of a beauty who scorned the advances of the demi-god Māui and is the traditional name of the "Fern Grotto," the most famous cave in Wailua located near the junction of the North and South forks of the Wailua River (Figure 8; Dickey 1917:33). Additionally, Manu‘ena, the cave of the mudhens the demi-god Māui branded for withholding the secret of making fire, was said to be at Manu‘ena (Wichman 1998:73; understood as near Holoholokū Heiau)

3.4 *‘Ōlelo No‘eau* (Proverbs)

Hawaiian knowledge was shared by way of oral histories. The following section draws from author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing selected place names relating to Wailua, Kaua‘i.

3.4.1 *‘Ōlelo No‘eau* #467

The following proverb discusses the sacred birthplace of chiefs, Holoholokū:

Hānau ke ali‘i i loko o
Holoholokū, he ali‘i nui;
hānau ke kanaka i loko o
Holoholokū, he ali‘i no;
hānau ke ali‘i mawaho a‘e o
Holoholokū, ‘a‘ohe ali‘i,
he kanaka ia.

The child of a chief born in
Holoholokū is a high chief;
the child of a commoner born
in Holoholokū is a chief;
the child of a chief born outside
of the borders of Holoholokū
is a commoner. [Pukui 1983:56]

Figure 8. Photo of Fern Grotto at Wailua River, n.d. (courtesy of Hawai‘i State Archives)

3.4.2 *‘Ōlelo No‘eau* #1648

The proverb below describes the vast waterways of Wailua, Kaua‘i:

Ka wai hālau o Wailua.

The expansive waters of Wailua. [Pukui 1983:178]

3.4.3 *‘Ōlelo No‘eau* #1724

The *‘ōlelo no‘eau* below discusses Makaiwa, a surf spot enjoyed by many:

Ke kai kaha nalu o Makaiwa.

The surfing of Makaiwa.

Famous is the surf of Makaiwa at Wailua, Kaua‘i, enjoyed by the native chiefs and royal guests from the other islands. [Pukui 1983:185]

3.5 *Oli* (Chants)

In the epic tale of Hi‘iakaikapoliopele, Pele’s younger sister, Hi‘iaka, is given the task of searching for Lohi‘au, a high chief of Kaua‘i and Pele’s lover. When Hi‘iaka arrives in Wailua, she finds that a bridge that was used to cross the Wailua River has been destroyed by Nounou, the *mo‘o* who inhabits the area. (This *wahi pana* is mentioned in Section 3.3.2.)

Kūnihi ka mauna i ka la‘i ē	The mountain stands steeply in the calm
‘O Wai‘ale‘ale lā i Wailua	Wai‘ale‘ale in Wailua
Huki a‘ela i ka lani	Tossed into the heavens
Ka papa ‘auwai o Kawaikini	Was the bridge of Kawaikini
Ālai ‘ia a‘ela e Nounou	Blocked by Nounou
Nalo ka ipu ha‘a	Ipuha‘a Hill has disappeared
Ka laulā mauka o Kapa‘a ē	Into the upper expanse of Kapa‘a
Mai pa‘a i ka leo, he ‘ole kāhea mai ē	Don’t withhold the voice, there is no call.

[Kamehameha Schools 2016]

Section 4 Traditional and Historical Accounts

4.1 Early Historic Period

Few Westerners visited Wailua in the years just after Cook’s arrival and detailed Western historic descriptions of the area are scarce. Most of the voyagers during the late eighteenth and early nineteenth centuries landed at Waimea, on the southwestern side of the island, a location that would eventually overshadow Wailua in its royal importance because of the opportunities there to associate and trade with these foreigners (Lydgate 1920).

However, in March 1793, Captain George Vancouver considered Wailua to be the “principal residence of the king.” He had already visited the island several times, both under Captain James Cook and later as captain of his own expedition, and he knew this fact well and attempted to land there. Although conditions prevented him from anchoring, Vancouver observed the area from off shore and gave this description:

> This part seemed to be very well watered, as three other rapid small streams were observed to flow into the sea within the limits above mentioned. This portion of Attouai [Kaua‘i], the most fertile and pleasant district of the island, is the principal residence of the King, or, in his absence, of the superior chief, who generally takes up his abode in an extensive village, about a league to the southward of the north-east point of the island. Here *Enemo* the regent, with the young prince *Tamooerrie* [Kaumuali‘i] were now living. [Vancouver 1798:221–222]

Within decades of initial Western Contact, the area lost its ancient importance. It also began to lose its population, as the *ali‘i* who enjoyed and benefited from their contact with Westerners spent more time in Waimea, the preferred anchorage for visiting ships. And the complex of *heiau* at Wailua lost its great significance after the abolishment of the *kapu* system.

Missionary Hiram Bingham passed through Wailua twice in 1824 and visited the birthplace of King Kaumuali‘i (Pōhaku Ho‘ohānau), a *hōlua* (sled course) slide, and the lower falls on the south fork of the river (Bingham 1847:220, 231), but made no mention as to the size or extent of the settlement there.

Debora Ha‘akūlou Kapule was a member of Kaua‘i’s royalty, the former wife of Kaua‘i sovereign Kaumuali‘i. Arguably the most powerful person on Kaua‘i at the time of the founding of the American United Church of Christ’s mission in 1820 (Stauffer 1994:iii), Kapule made the mission very successful but eventually lost much of her power between 1821 and 1825. She left an impression on Lieutenant Charles Wilkes of the U.S. Exploring Expedition, who came to Wailua in October of 1840 and recorded the following:

> The country on this route was uninteresting, until they reached Wailua, the residence of Deborah, a chief woman of the islands, readily known as such from her enormous size, and the cast of her countenance. She has a person living with her called Oliva Chapin, who speaks English, and has learned how to extort money. Deborah has about forty men in her district; but they were absent, being employed in the mountains cutting timber to pay the tax to the king.

> Near Deborah’s residence are extensive fishponds belonging to her, which have been made with great labour. They are of different degrees of saltiness. The fish are taken from the sea when young and put into the saltiest pond; as they grow larger; they are removed into one less salt, and are finally fattened in fresh water. While our gentlemen were there, Deborah received young fish in payment of the poll-tax, which were immediately transferred to her ponds.
>
> Wailua (two waters) was formerly a place of some importance. It is situated on a small stream of the same name, in a barren, sandy spot.
>
> Deborah furnished them with a double canoe, to carry them up the river to visit the falls. Taking the western branch, they ascended it for two and a half miles.
>
> There are many good taro-patches and sugar plantations on its banks. They landed in what appeared to have been an old crater, in front of a basin, with high perpendicular bank. The low grounds along the river are extremely fertile, producing bread-fruit, sugar-cane, oranges, etc. The latter, however, are suffering from the blight, and some of the trees were covered with a black smut, produced by a species of aphis.
>
> In ascending, an insulated black rock is passed, known as the ‘Muu,’ which has been detached from a high rocky bluff, which is remarkable for the dikes visible in it.
>
> They afterwards ascended the bank, two hundred feet high, and crossed about half a mile to the falls, over a plain covered with grass and wild sugar-cane. The stream was very small, running sluggishly, and passed over a precipice of barren rocks, one hundred and sixty feet in height. Although there is neither tree nor shrub along the stream above the fall, the valley beneath is filled with them; the most conspicuous was the pandanus. The whole scene is picturesque. Below, the falls present a very curious appearance, the wind continually breaking and dispersing the water in heavy showers over a great variety of ferns, which are growing in the crevices of the rocks. The volume of water does not exceed ten hogsheads a minute. In the basin beneath were found many fine specimens of *Neritina granulata*, and two other species were found further down the stream, about four feet below the surface; these were procured by diving. Mr. Rich obtained specimens of the plants.
>
> Mr. Peale found but few birds; ducks were abundant on the river’s banks, some of which were killed. Rushes were growing along the banks from eight to ten feet in length, four or five feet under the water; besides these, the banks were covered with hibiscus and ricinus (castor-oil trees), growing wild. [Wilkes 1846:4:68–69]

On his deathbed in May 1824, Kaumuali‘i orally stated that he wanted the lands to remain “as is” for the *ali‘i* and *maka‘āinana*—those who had lands would continue to hold them, and those who did not have lands would not have any (Stauffer 1994:52–54). This went against the traditional practice of *kālai‘āina* (politics, political economy), in which upon the death of a sovereign the land titles of the *ali‘i* would be rearranged, though the *maka‘āinana* lands remained reasonably fixed. In choosing to disregard the *kālai‘āina*, Kaumuali‘i echoed Kamehameha I, whose death did not initiate the *kālai‘āina* for the other Hawaiian islands (Stauffer 1994:53).

After Kaumuali‘i’s death, the people of Kaua‘i were in turmoil regarding land tenure distribution since Kaumuali‘i’s reign was subservient to Kamehameha II (Liholiho) (Stauffer 1994:52–54). However, Liholiho pronounced he would not take Kaumuali‘i’s land.

The governorship of Kaua‘i was given to Kahalai‘a, a nephew of Kalanimoku, an *ali‘i* of Hawai‘i Island. Control of the island rested with Kalanimoku and other powerful *ali‘i* who came from Hawai‘i Island but ruled from Honolulu (Stauffer 1994:51). Kaumuali‘i’s son, George Humehume, believed he should have been appointed governor and successor to his father and led a revolt in 1824. It appears that Debora, who controlled significant portions of land, sided with the status quo:

> Probably the major difference between the interests of Humehume and Debora: the matter of land and wealth. With control of land came claims on the people living there and in this way came the revenues or produce necessary for the quality of life of the *ali‘i*. Debora had lands; Humehume did not. She would benefit from the status quo. He would benefit from a Kaua‘i-controlled *kālai‘āina*. It was that simple. [Stauffer 1994:57]

Humehume and his troops attacked the fort in Waimea in August 1824. When news of the attack reached Honolulu, the *ali‘i* there became involved, with Kalanimoku and later the regent Ka‘ahumanu sending several boats with troops to Kaua‘i for reinforcement (Stauffer 1994:59). A brutal battle broke out leaving men, women, and children dead from Kōloa to Līhu‘e (Stauffer 1994:61).

Kalanimoku returned to O‘ahu, convening a council of *ali‘i* to decide the next ruler of Kaua‘i. As Kamehameha II had died in Great Britain, the council called for the island to be given to the new king, Kamehameha III (Kauikeaouli). Kahalai‘a was removed from the position of governor and Kalanimoku appointed in his place; as a consolation, Kahalai‘a was made guardian of the king, who was still underage.

More than 20 years later, a final *kālai‘āina* would be established: the Māhele. The thousands of acres on Kaua‘i originally controlled by Debora Kapule were subject to claims by both Kapule and the Crown, but because a convention had been established that “traditional” land usage began in 1824 (the year Kalanimoku became governor), Debora could not rely on land shares that preexisted the revolt (Stauffer 1994:67). Debora claimed the *ahupua‘a* of Wailua had been given to her by Ka‘ahumanu, who said that she was the *haku‘āina* (landowner, landlord). But Debora’s claim was unsuccessful, and the thousands of acres that were once hers became Crown Lands controlled by the king. Debora was awarded a handful of acres including the fishponds mentioned above which are located on the property of the current Coco Palms. Debora stayed in Wailua until 1835, eventually moving to Waimea to be closer to the mission. Debora Kapule died in 1853.

4.2 The Māhele

To try to maintain sovereignty of the land, the Mō‘ī (King) Kauikeaouli (Kamehameha III) in 1846–1848 supervised the Māhele—the division of Hawaiian lands—that transformed the land system in Hawai‘i from collective to private ownership. The Māhele was modeled after Western concepts. Crown Lands were to be reserved for the Mō‘ī and the royal house, Konohiki Lands were claimed by *ali‘i* and their *konohiki* (headman of an *ahupua‘a* under the chief), and Government Lands were set aside to generate revenue and managed by the government. In 1850,

these three categories of land were subject to the rights of the *maka‘āinana* and other tenants (naturalized foreigners, non-Hawaiians born in the Islands, or long-term resident foreigners), who could make claims for their habitation and agricultural plots, known as *kuleana* (Native land rights) parcels (Figure 10; Chinen 1958:8–15).

Under the Kuleana Act of 1850, the *maka‘āinana* were required to file their claims with the Board of Commissioners to Quiet Land Titles (Land Commission) within a specified time period in order to apply for fee-simple title to their lands. The claim could only be filed after the claimant arranged and paid for a survey, and two witnesses testified that they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land since 1839, and knew that no one had challenged the claim. Then the *maka‘āinana* could present their claims to the Land Commission to receive their Land Commission Award (LCA) (Kame‘eleihiwa 1992).

Not everyone who was eligible to apply for *kuleana* lands did so, and not all of those claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. In addition, some *maka‘āinana* may have been reluctant to claim *‘āina* that had been traditionally controlled by their *ali‘i*, some may not have been familiar with the concept of private land ownership, and some may have not known about the Māhele, the process of making claims (including arranging of a survey) or the strict deadline for making claims. Further, the Land Commission was comprised largely of foreign missionaries, so the small number of claimants and awards may reflect only those *maka‘āinana* who were in good standing with the church. Significantly, the surveying of the land was not standardized (Kame‘eleihiwa 1992:296–297).

A total of 14,195 claims were filed and 8,421 awards were approved for about 29% of the 29,220 adult Native Hawaiian males living at the time of the Māhele, averaging 3 acres each (Kame‘eleihiwa 1992:295). Out of the potential 2,500,000 acres of Crown and Government lands, 28,658 acres of land were awarded to the *maka‘āinana*—less than 1% of the total acreage of Hawai‘i (Kame‘eleihiwa 1993:295). The small number of *kuleana* awards and their small size prevented the *maka‘āinana* from maintaining their independent subsistence, often forcing them to abandon their newly acquired property (Chinen 1958:32).

Although there are no LCAs near the Blue Hole Diversion, a number of *kuleana* lands can be found near the mouth of the Wailua River. *Kuleana* land use includes house lots, *lo‘i kalo*, and a fishpond adjacent to the ocean (Coco Palms area). See Figure 9 for a compilation of LCAs and associated land use.

4.3 Mid- to Late 1800s

As in most other well-watered areas in Hawai‘i, rice crops began taking over former *lo‘i kalo* (taro terrace) in the second half of the 1800s. This alternating pattern of land use by the Chinese rice farmers and native *kalo* (taro; *Colocassia esculenta*) growers continued through the end of the nineteenth century (Figure 11). Knudsen (1991) visited Wailua in 1895 and wrote:

> We rode through the Lihue Plantation cane fields, passed through Hanamaulu and came to the Wailua River. What a sight! The great river lay clear and placid—winding away up toward the mountains with rice fields and taro patches filling all the low lands. [Knudsen 1991:152]

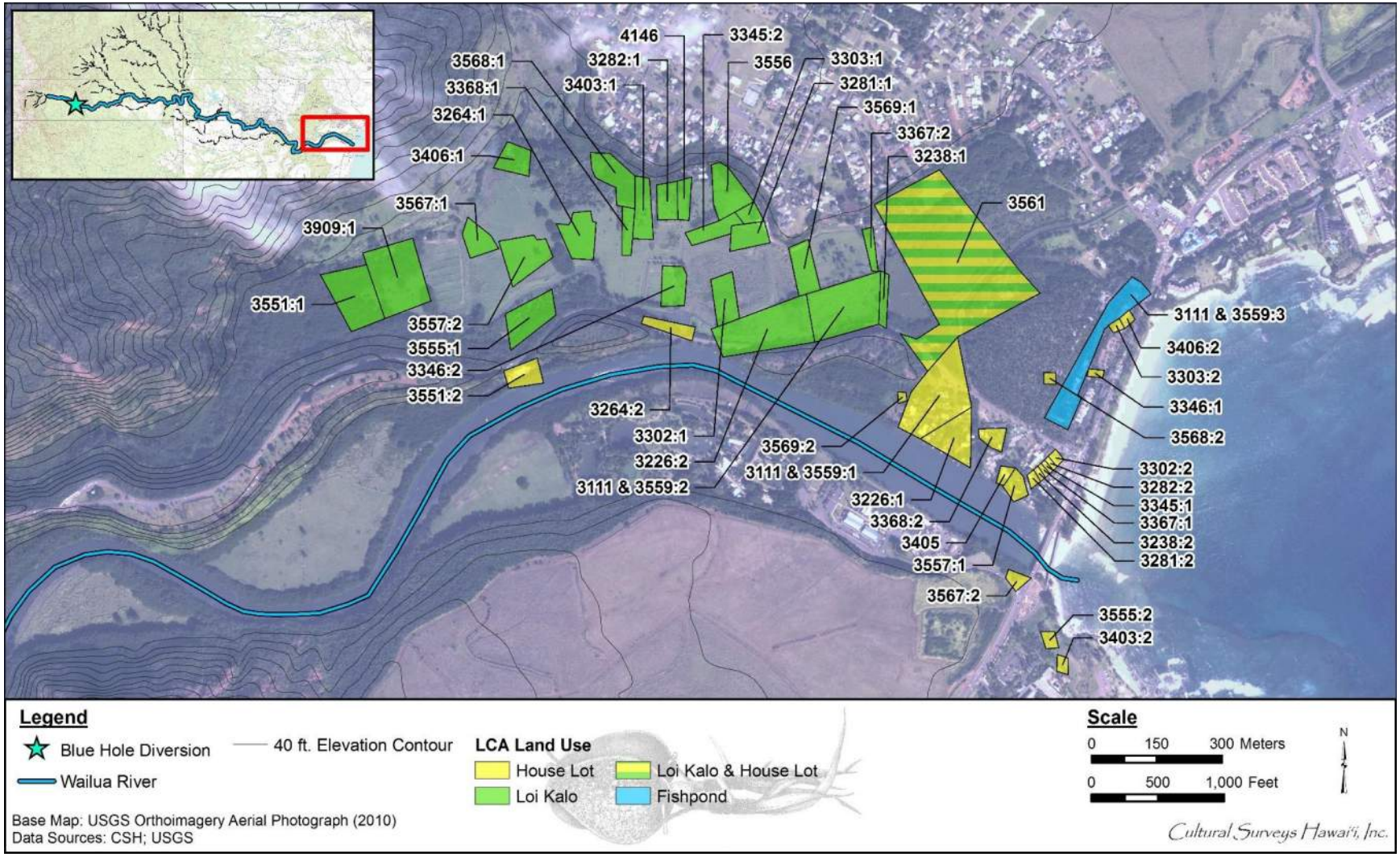

Figure 9. 2010 USGS Orthoimagery aerial photograph with Wailua Ahupua‘a LCAs and associated land use

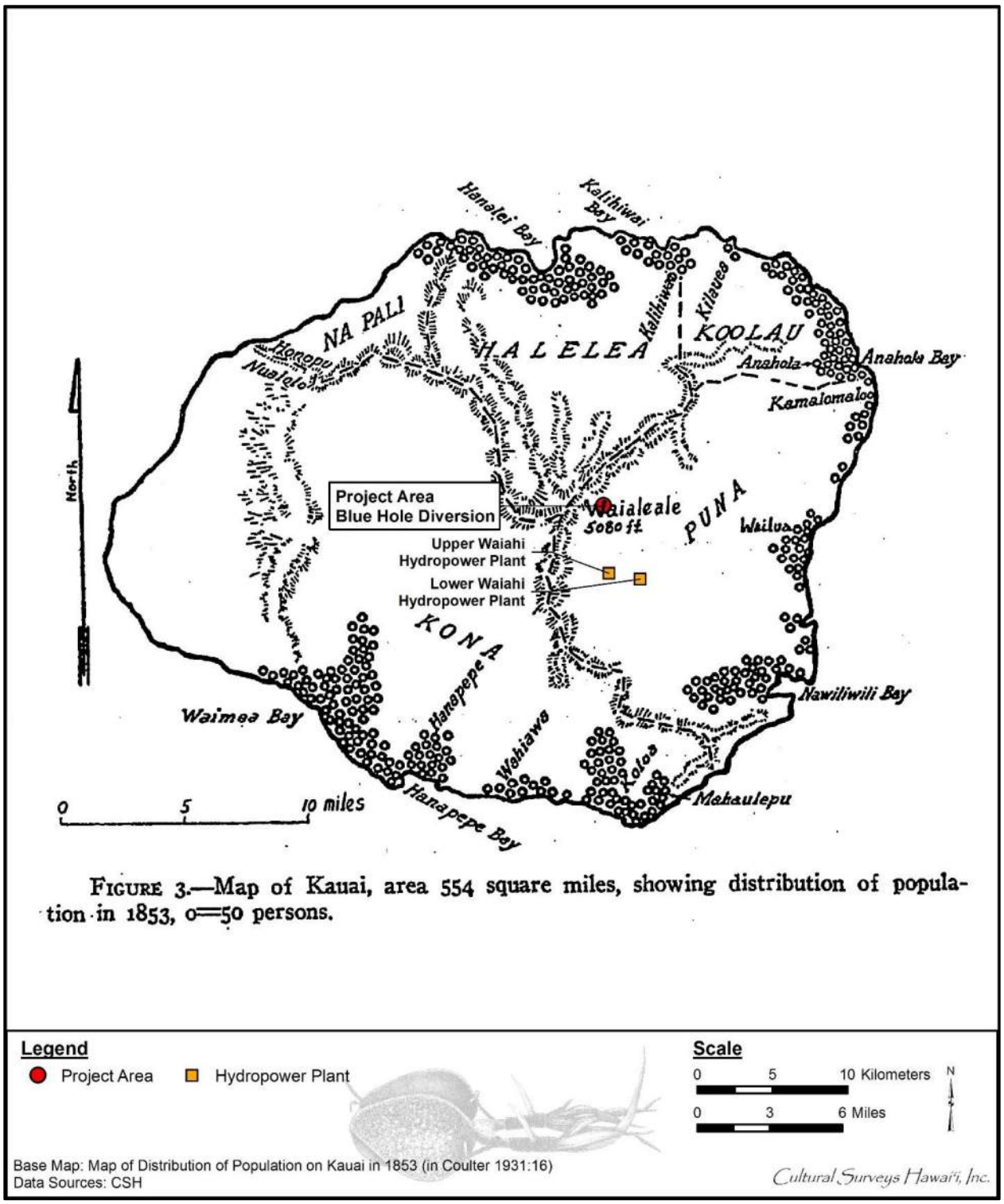

Figure 10. 1853 map of population distribution of Kaua‘i with project area in red and hydropower plant in yellow (Coulter 1931:16)

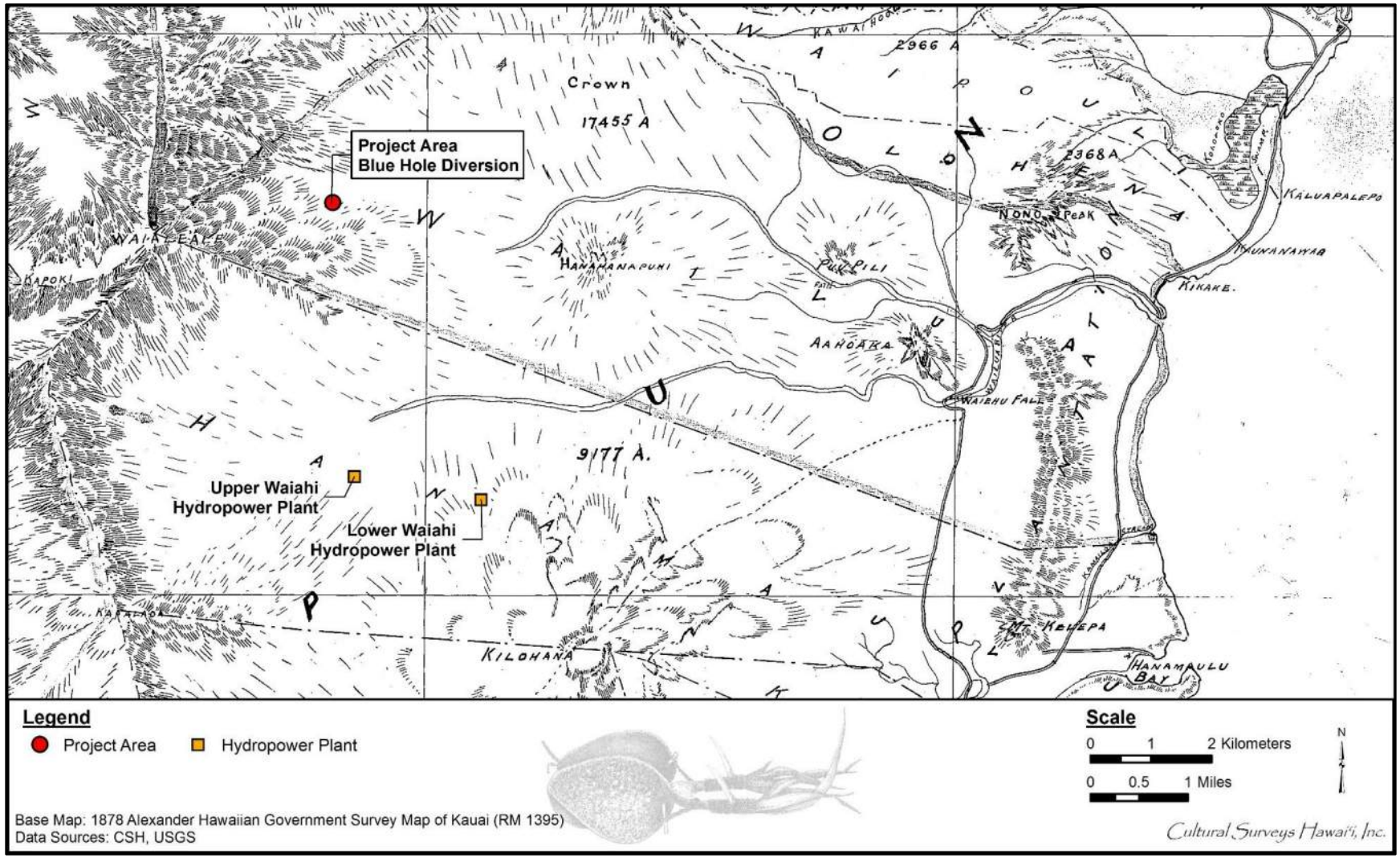

Figure 11. 1878 Alexander Hawaiian Government Survey map of Kaua‘i with project area and hydropower plant locations

By 1935, Handy (1940:67) found no *kalo* being cultivated. The terraces had been taken up by rice, sugarcane, sweet potato and pasture. However,

> Kapa‘a, Waipouli, Olohena, and Wailua are districts which have broad coastal plains bordering the sea, any part of which would be suitable for sweet potato plantings; presumably a great many used to be grown in this section. There are a few flourishing plantations in Wailua at the present time. [Handy 1940:153]

Debora Kapule left Wailua in the early 1850s and chose to move back to Waimea. Upon her death in 1853, her lands in Wailua, as well as those of her son, Kaumuali‘i, were willed to her adopted daughter Kaluaipihana. By 1867 a Mr. LaPaz indicated that nothing remained of Kapule’s complex (Kikuchi et al. 1976:7). This was echoed by Gerald Fowke in the early 1920s:

> Near the mouth of the Wailua River . . . is the former abode of the royal family. The place is so overgrown, except in the few cultivated spots, that no examination of it can be made. No traces of the residences are apparent although the stone boundary walls of the grounds are still standing. [Kikuchi et al. 1976:11]

Ernst Lindeman leased Kapule’s *kuleana* and in the mid-1890s planted the 2,000-tree coconut grove for which Coco Palms Resort would become famous. The site was planted with nuts from Sāmoa for the purpose of harvesting copra.

4.4 1900s

4.4.1 Hanamā‘ulu Ahupua‘a

The *ahupua‘a* of Hanamā‘ulu was purchased by Paul Isenberg, the manager of Lihue Plantation from 1862–1878 (Damon 1931:742–747). By 1870, the plantation owned 17,000 acres of undeveloped land in Hanamā‘ulu (Figure 12 and Figure 13). Albert Spencer Wilcox started the first sugarcane plantation in Hanamā‘ulu, called the Hanamaulu Plantation (Dorrance and Morgan 2000:28). A mill was erected in 1877 which Lieutenant George G. Jackson recorded on an 1885 map of Hanamā‘ulu Bay. Connected to the fields by railroad, the Hanamaulu Mill operated until 1920, when it was converted into housing for laborers. In 1898, Hanamaulu Plantation merged into the Lihue Plantation. Commercial sugarcane cultivation continued in Līhu‘e until 2000.

4.4.1.1 Kapaia Camp and Kapaia Swinging Bridge

Southeast of the project area a plantation camp called Kapaia was located near the Immaculate Conception Church. Plantation camps housed various plantation operators in discrete ethnic communities. Workers and their families traveled on a foot bridge across Hanamā‘ulu Stream to go back and forth from work, school, shopping, and play. Heavy rains often swept through the stream, and there were at least two attempts to rebuild the bridge with cement footings (Save Kapaia Swinging Bridge 2012).

In 1948, the Kapaia footbridge was rebuilt as a 125-ft suspension footbridge, called the Kapaia Swinging Bridge (Figure 14). Two tall wooden towers were built across Hanamā‘ulu Stream to enable Chinese, Filipino, and Portuguese laborers to reach their respective camps on opposite sides of the stream (Voorhis 2011). Upper Kapaia contained much of the plantation housing, including a Filipino plantation camp as well as many Japanese and Hawaiian households, a large cock

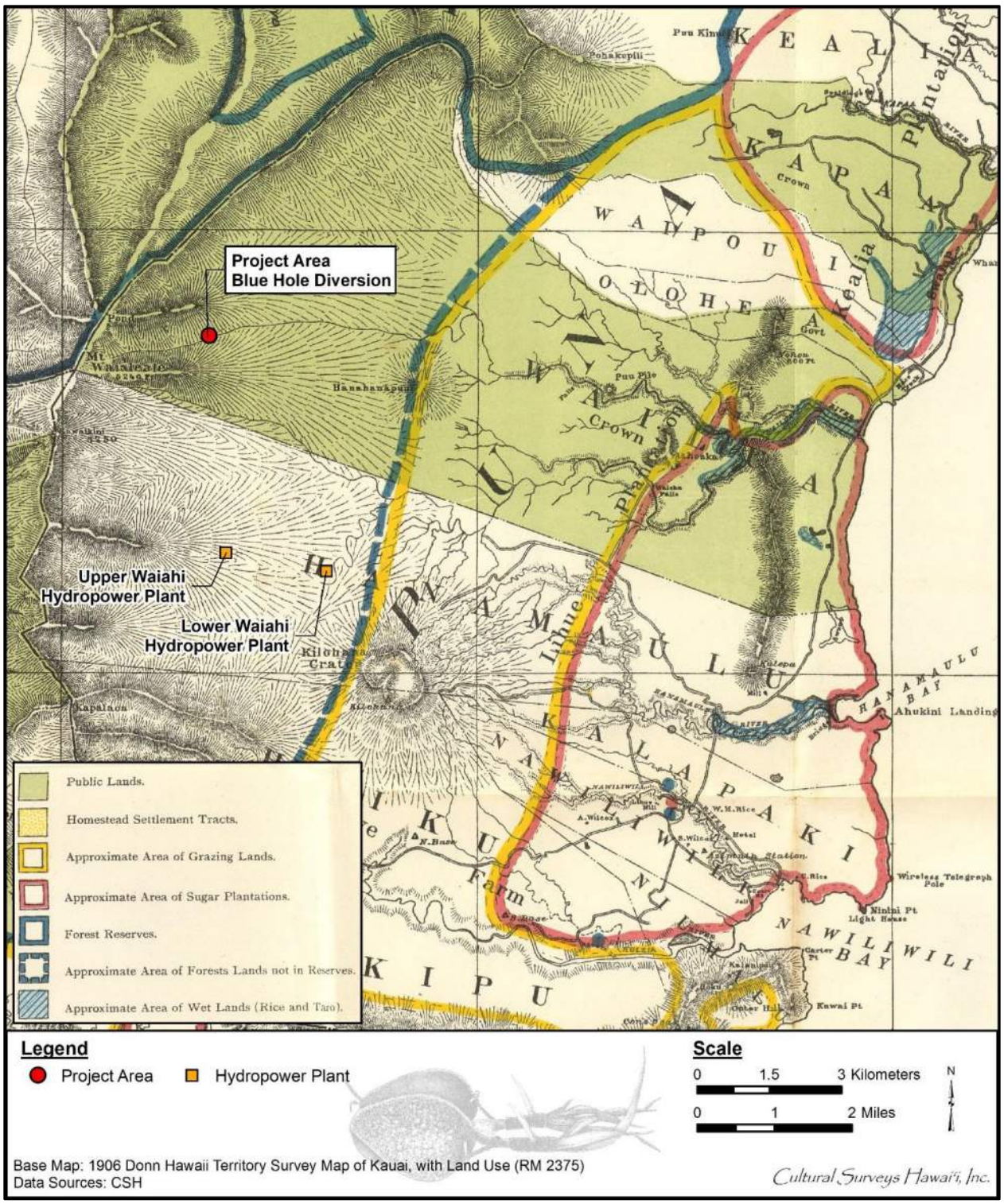

Figure 12. 1906 Donn Hawaii Territory Survey map of Kaua‘i with land use; note the project area is on public lands and the *makai* (seaward) areas were utilized as forest reserve, grazing lands, and sugar plantation land

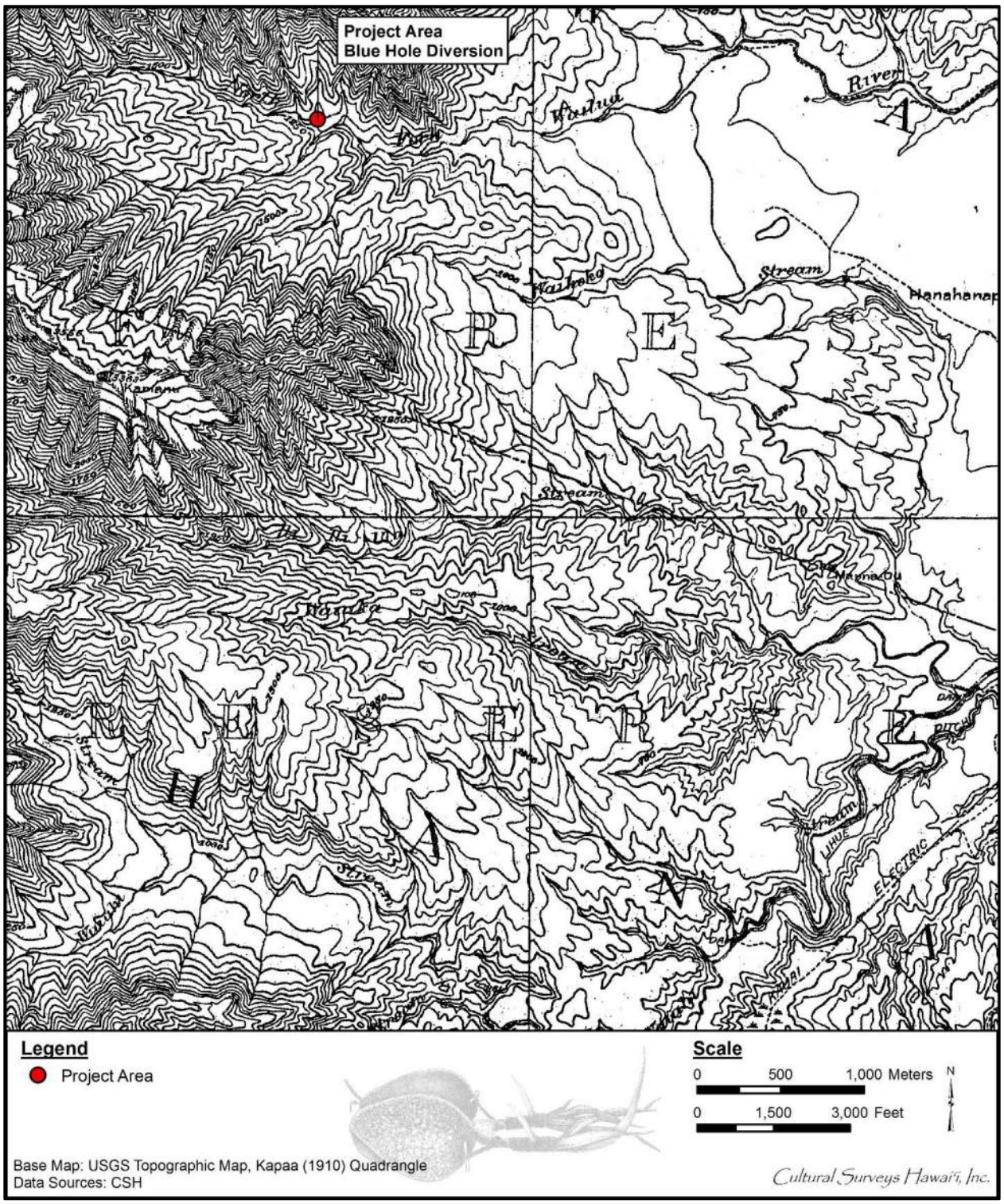

Figure 13. 1910 Kapaa USGS topographicquadrangle with project area in red

Figure 14. Photo of the dilapidated Kapaia Swinging Bridge (CSH 2011)

fighting area, a brothel, and various farms. Lower Kapaia contained businesses and churches. The bridge was still used to cross between Hanamā‘ulu and Kapaia until, after years of exposure, the plank board and steel rope structure deteriorated to such an extent that Kaua‘i County closed and barricaded it in 2006 for safety reasons. As a historical crossroad of the plantation culture, the Kapaia Swinging Bridge was listed on the State Register of Historic Places in 2008 (SIHP # 50-30-11-9077) (Voorhis 2011) with the application stating that “Our ultimate goal is to honor those who came before us by keeping this historical treasure as a bridge connecting the descendants of the Hawaiian and immigrant laborers to each other, and as a bridge welcoming those desiring to be a part of a truly special culture” (Curtis 2010).

4.4.2 Wailua Ahupua‘a

As a direct result of the availability of large tracts of land for sale during the Māhele, the Lihue Plantation was established in 1849 by Henry Augustus Pierce, Judge William Little Lee (chairman of the Land Commission), and Charles Reed Bishop as one of three major plantations in eastern Kaua‘i. The first 3,000 acres were purchased in Nāwiliwili and an additional 300 acres were purchased in Ahukini in 1866. The Lihue Plantation featured a steam-powered mill built in 1853, the first use of steam power on a Hawaiian sugar plantation, and the 10-mile-long Hanamaulu Ditch built in 1856 by William Harrison Rice, which was the first large-scale irrigation project for any sugar plantation (Dorrance and Morgan 2000:28; Moffatt and Fitzpatrick 1995:103; Wilcox 1996).

The first stretch of the Lihue Plantation Company railroad was completed and the first sugar moved by rail on 7 January 1892. By 1921, the Lihue Plantation Company was reputed to have the most modern and extensive railroad system in the Islands. In that same year the Lihue Plantation Company sponsored the separately incorporated Ahukini Terminal and Railway Company (AT&R), which “was inaugurated as a common carrier railroad to operate between Ahukini and Kealia” (Condé and Best 1973:166). In 1934, the Lihue Plantation Company absorbed the AT&R, which then became an operating part of its parent company. The conversion from railroad to truck hauling began in 1957 and was completed by 1959. The 1959 annual report noted “With the completion of the harvesting season this year (October 10, 1959) hauling cane over our railroad system comes to an end. We are the last plantation in the Island to give up the railroad and move to truck hauling. This marks the end of an era” (Condé and Best 1973:165–169).

4.5 Previous Archaeological Research

Hanamā‘ulu and Wailua Ahupua‘a were inhabited since the pre-Contact period, though development related to the plantation has likely destroyed some traditional Hawaiian cultural resources. Various archaeological studies in the vicinity of the project area have documented both pre- and post-Contact sites. Figure 15 shows previous archaeological project areas and any cultural and historic sites found during survey work in the vicinity of the current project area, in context of associated streams, ditch systems, and hydropower plants.

4.5.1 Bennett 1931

Bennett (1931) is the first to mention the archaeology in the vicinity of the project area in his book, *Archaeology of Kauai*. Bennett documented various shrines (as distinct from *heiau*) on the island, noting Ka‘awako as one such shrine in the Waimea district, but did not record its location. Bennett included a description by Thomas Thrum:

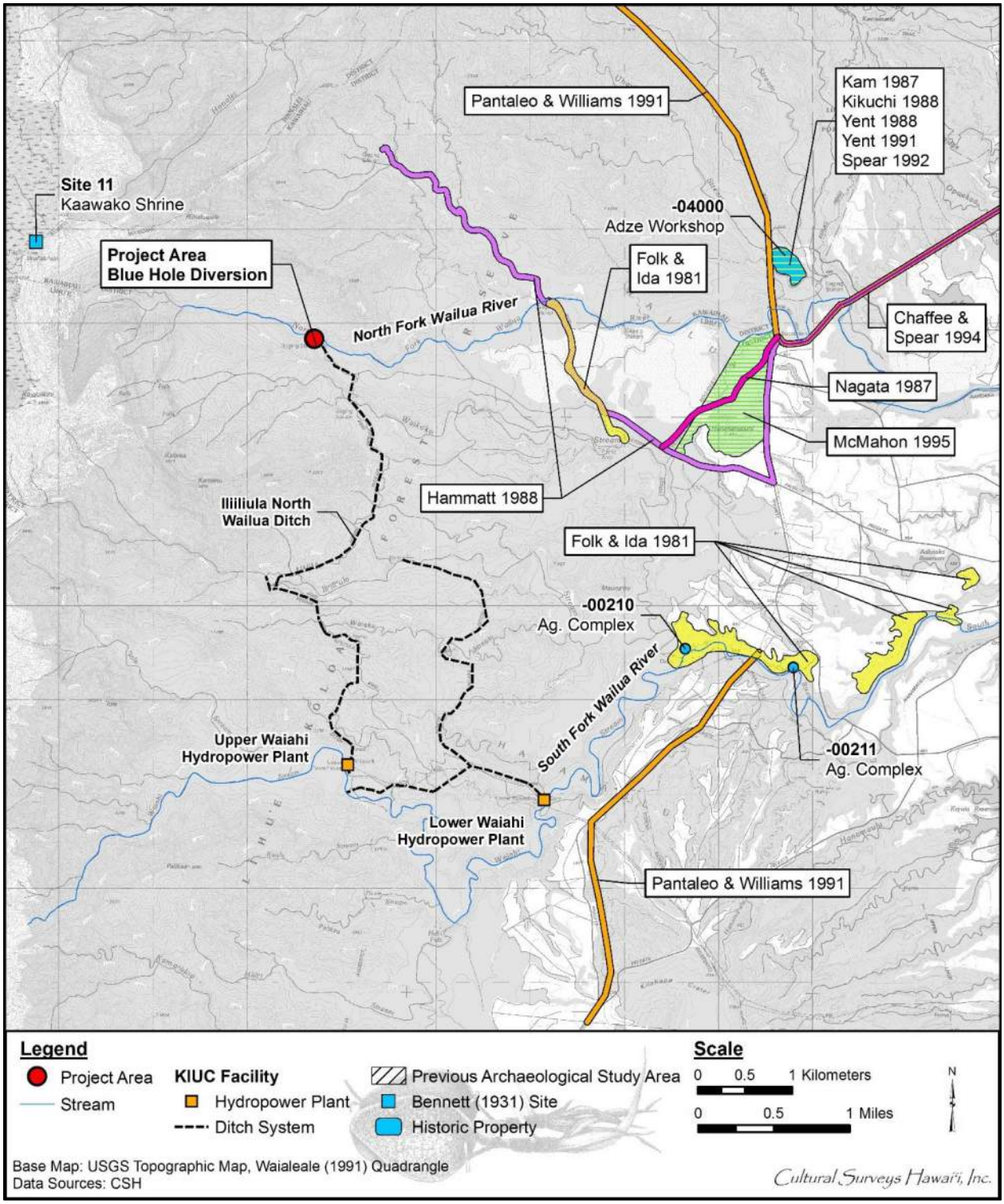

Figure 15. 1991 Waialeale USGS topographic quadrangle, with project area, hydropower plants, ditch systems, previous archaeological sites, and cultural and historic sites

> Kaawako is a small rectangular structure about five by seven feet and two feet high, made of smooth lava slabs, on the summit of Waialeale, between two knolls, in the open country near the pond. This is very sacred; to this day you must throw on it the most valuable thing you have with you—money, food, tools, or whatnot,—to propitiate the gods of the mist lest they envelop you and you lose your way in that tangle of woods and gulches and level plateaus of the interior of Kauai. [Bennett 1931:152]

4.5.2 Folk and Ida 1981

An archaeological reconnaissance was conducted on portions of the south fork of the Wailua River. The study was requested by the U.S. Army Corps of Engineers as part of a hydropower study. Findings included three pre-Contact *‘auwai* (ditches) and two *lo‘i* (irrigated terraces) in fair state for preservation (Folk and Ida 1981:5). SIHP numbers were issued for agricultural complexes (SIHP #s 50-30-07-0210 and -0211). A rice mill was also located during the reconnaissance.

4.5.3 Kam 1987

In 1987, a letter report indicated a field inspection was conducted by State of Hawai‘i archaeologist Wendell Kam for the proposed Keahua Aboretum Expansion project. A review of Bennett’s work revealed cultural resources in the lower portions of the Wailua River, but none in the proposed project area (Kam 1987:5). Based on the results of the field inspection, it was determined that the proposed project would have no effect on any cultural resources in the area.

4.5.4 Nagata 1987

In October 1987, a field inspection was conducted for a proposed road for the Biomass Planting project. The 2-mile route traversed two types of terrain, which reflected “varying degrees of previous alteration ranging from cultivated sugar cane fringed by california grass . . . to densely foliaged and heavily canopied areas” (Nagata 1987:1). The heavily vegetated areas made it difficult to navigate through and vision was limited restricting the field inspection. Although previous research indicates pre-Contact sites in the vicinity of the Wailua River, none were found during the field inspection.

4.5.5 Hammatt 1988

An archaeological reconnaissance was conducted by CSH for the proposed hydropower project along the north branch of the north fork of the Wailua River (Hammatt 1988:i). The proposed project included an approximately 8,000-ft long pipeline running *mauka* to *makai*. During the reconnaissance, no archaeological remains were located within the project area. However, based on historic evidence, a potential site for traditional irrigated agriculture was located near the juncture of the north and south fork.

4.5.6 Kikuchi 1988

In February 1988, Dr. William K. Kikuchi led his Kaua‘i Community College archaeology class in an archaeological reconnaissance at the site of the proposed Keahua Arboretum Expansion (Kikuchi 1988:2). The class traversed the entire area and noted a bulldozer that was actively leveling a section near the stream found an adze making workshop on the *mauka* portion. The area was flagged. Cores and flakes were noted to have been dispersed. Samples were taken for study purposes.

4.5.7 Yent 1988

Yent (1988) followed up to Kam’s (1987) field inspection and Kikuchi’s (1988) archaeological reconnaissance. Yent noted that prior to Kikuchi’s observation of a bulldozer leveling the land, the area had been covered in dense *hau*, which prevented a thorough survey (Yent 1988:2). Yent pointed out that the site was significant due to the limited adze workshops identified on Kaua‘i. Two test pits were excavated to determine whether the adze scatter extended below the surface. A total of 2,300 basalt pieces were collected from the surface and test pits.

4.5.8 Pantaleo and Williams 1991

In 1991, Applied Research Group, Bishop Museum conducted an archaeological surface survey of selected portions of a proposed transmission line replacement corridor, which ran north through Līhu‘e District and continued west through Hanalei and Kawaihau districts (Pantaleo and Williams 1991:1).

During the survey, no new archaeological sites were encountered. However, the transmission corridor passed through SIHP # 50-30-03-1006, a series of pond field remnants in Hanalei Valley and adjacent to SIHP # 50-30-07-4000, an adze workshop on one of the tributary streams of the Wailua River (Pantaleo and Williams 1991:3).

4.5.9 Yent 1991

In 1991, the Department of Land and Natural Resources (DLNR) Division of State Parks conducted an archaeological survey for a Clivus Multrum (self-composting toilet) at Keahua Arboretum (Yent 1991). This survey had been recommended since previous archaeological materials were found during vegetation removal for the arboretum’s expansion (Kikuchi 1988; Yent 1988). During Yent’s surface survey, grass covered much of the site with the exception of several preforms and flakes scattered around the pond feature (Yent 1991:2).

4.5.10 Spear 1992

In 1992, Scientific Consultant Services Inc. (SCS) conducted archaeological testing for Citizens Utilities-Kauai Electric Division (Spear 1992:1). The project area was within the Keahua Arboretum in the Līhu‘e-Koloa Forest Reserve, north of the north fork of the Wailua River between Keahua Stream and Iole Stream. Fifteen test units were excavated within and beyond the power line corridor. Cultural material was found in four of the test units including basalt flakes and charcoal flecking.

4.5.11 Chaffee and Spear 1994

In 1994, SCS conducted an archaeological inventory survey of Phase VI for the Citizens Utilities-Kauai Electric Division Powerline Pole Removal, Replacement, and Installation (Chaffee and Spear 1994). The purpose of the survey was to determine the presence or absence of any significant cultural remains lying within the transmission line corridor and if found, how they would impact the present powerline structure. All pole locations were surveyed and no cultural remains were found.

4.5.12 McMahon 1995

In 1995, the Division of Forestry and Wildlife (DOFAW), Hunter Safety Program proposed to design and construct the Hanahanapuni Shooting Range in Wailua Ahupua‘a, just east of the

Līhu‘e-Koloa Forest Reserve. An archaeological investigation had been recommended due to the discovery of SIHP # 50-30-07-4000, the Kauakahi Adze Workshop. The DLNR State Historic Preservation Division (SHPD) conducted the recommended archaeological investigation (McMahon 1995). The project area was a total of 209 acres. The *pu‘u* (peak) was covered in dense vegetation, therefore the survey was impossible to conduct. Several transects were made through the crater, but there was no evidence of historic sites or cultural remains on what was surveyed (McMahon 1995:3).

4.6 Wailua River (North Fork) Field Inspection

To assist with the consultation process, CSH archaeologist Scott Belluomini, B.A., and Principal Investigator Hallett H. Hammatt, Ph.D., conducted a brief field inspection on 8 and 9 October 2018 of some of the areas potentially suitable for taro production, based on the guidance provided in Ladefogod et al. (2009) (Figure 16 through Figure 20). In addition, the area *mauka* of the Blue Hole Diversion was briefly inspected for evidence of pre-Contact habitation. The field inspection was conducted under archaeological fieldwork permit number 18-05, issued by the SHPD pursuant to HAR §13-282.

The field inspection began at Stable Storm Ditch, an abandoned plantation-era ditch, and extended to the confluence of two large tributaries with Wailua River (North Fork) near the Section 2 and Section 3 boundary (Figure 21). The field inspection then extended *mauka* on both banks and the surrounding area of the Wailua River. Some cultigens were observed, including *kukui* (candlenut; *Aleurites moluccana*), *kī* (ti; *Cordyline terminalis*) plants, and *‘ohe* (giant bamboo; *Joinvillea ascendens*). Large portions of the inspected area contained dense areas of guava, Albizia, and cane grass (Figure 22 and Figure 23). Several areas were covered by dense ferns. A large stand of *koa* (*Acacia koa*) trees was observed south of the river. No evidence of taro production, including terrace remnants (such as retaining walls or stepped topography) or wild taro, was observed. In addition, no evidence of *‘auwai* was discernible. It appeared, based on the field inspection, that the area south of the river had been graded for access roads and plantation-era irrigation infrastructure. This included at least one large boulder pushpile.

Area 3, south of the river, was also briefly inspected. This area was more open than the denser forested area *mauka*. Dense cane grass made much of the ground surface unobservable except in areas of dense tree canopy. This area appeared more heavily disturbed than Area 2, likely due to the access roads for a former USGS gaging station, and to maintain Stable Storm Ditch. Additional areas of Area 2 were also observed, however, thick vegetation made traversing the area nearly impossible and ground visibility zero.

At the Blue Hole Diversion, the area north of the river was briefly inspected (Figure 24 through Figure 26). The area was densely covered with guava trees and moss (due to the very moist conditions of the area). The ground was observed to be quite steep with deep eroded cuts from the river during heavy rains. There was no discernible evidence of traditional Hawaiian use in the immediate vicinity of the diversion. While the field inspection does not find evidence of traditional Hawaiian taro production in the areas observed, it does not conclude that no such use ever occurred.

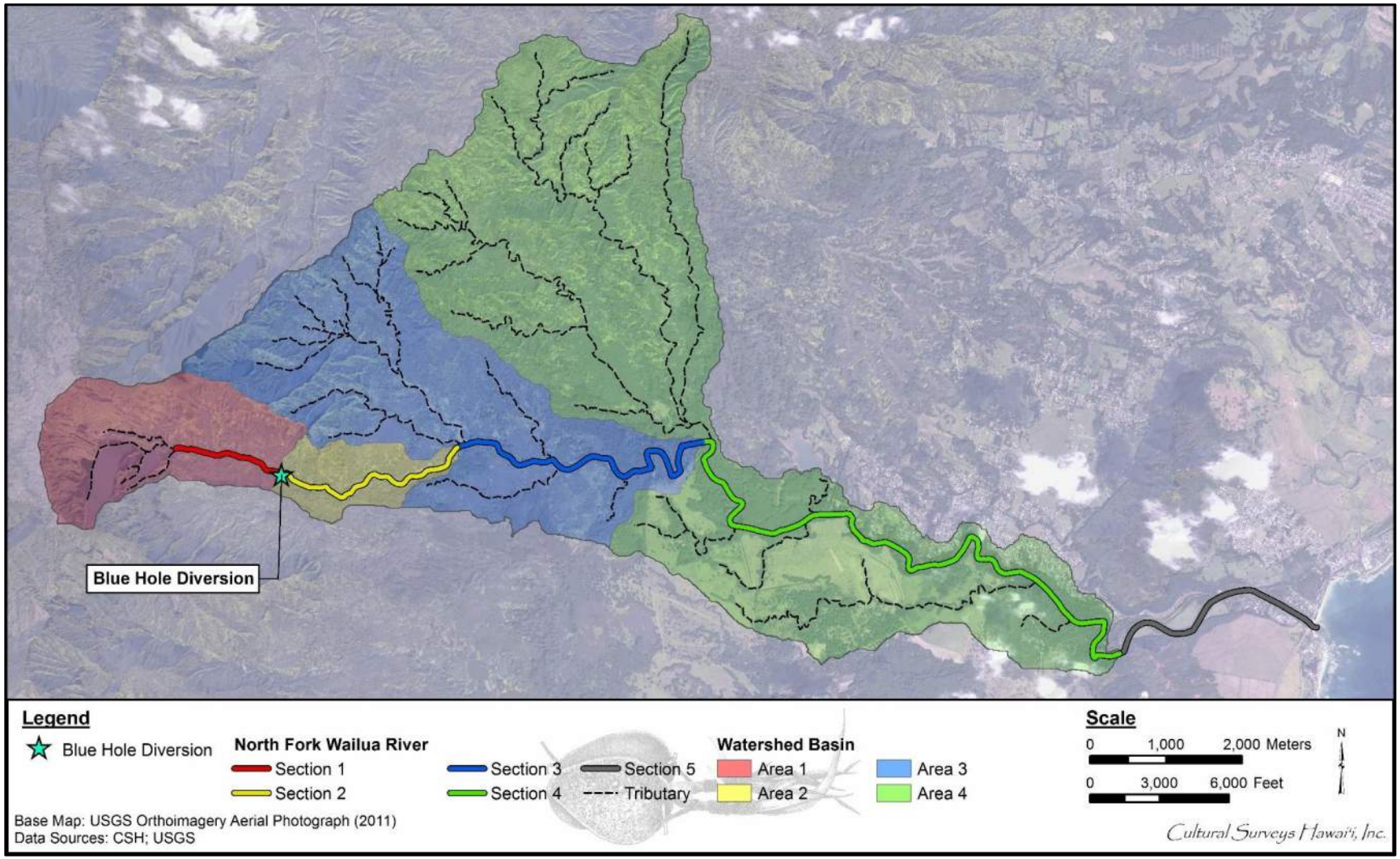

Figure 16. 2011 USGS Orthoimagery aerial photograph showing watershed basin areas and sections used in field inspection

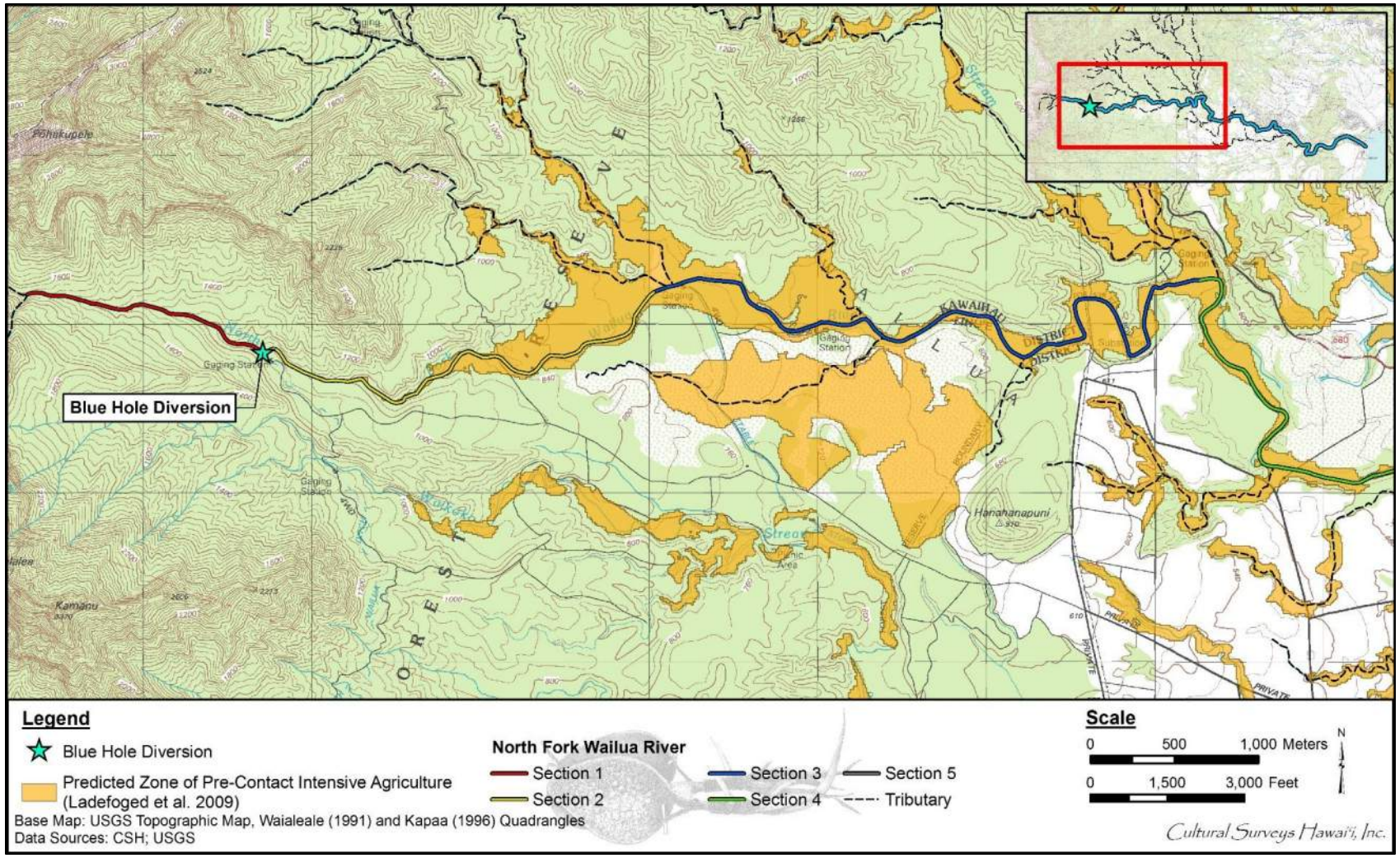

Figure 17. 1991 Waialeale and 1996 Kapaa USGS topographic quadrangles with predicted zones of pre-Contact intensive agriculture (Ladefoged et al. 2009) in Wailua Mauka

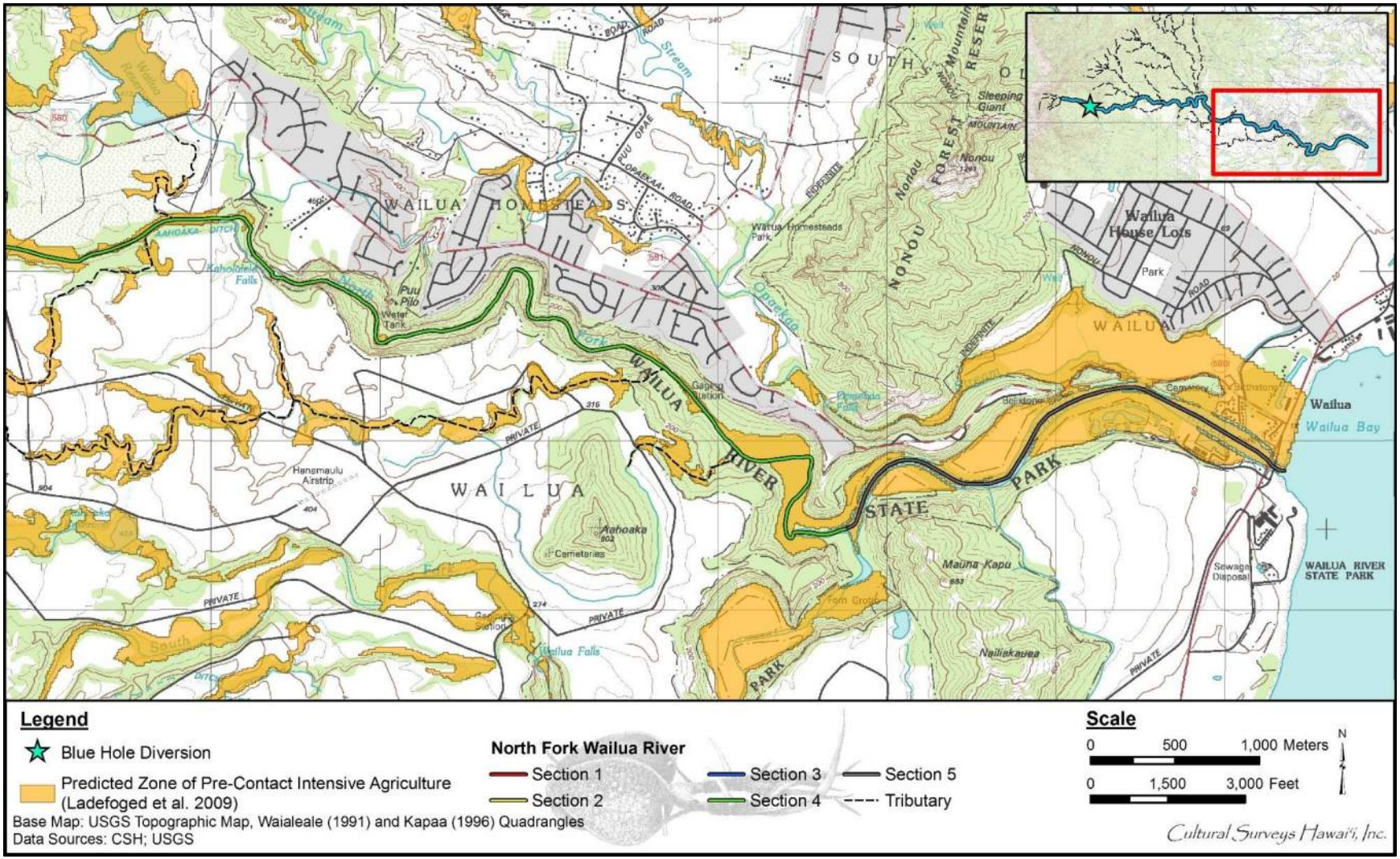

Figure 18. 1991 Waialeale and 1996 Kapaa USGS topographic quadrangles with predicted zones of pre-Contact intensive agriculture (Ladefoged et al. 2009) in lower Wailua Ahupua‘a

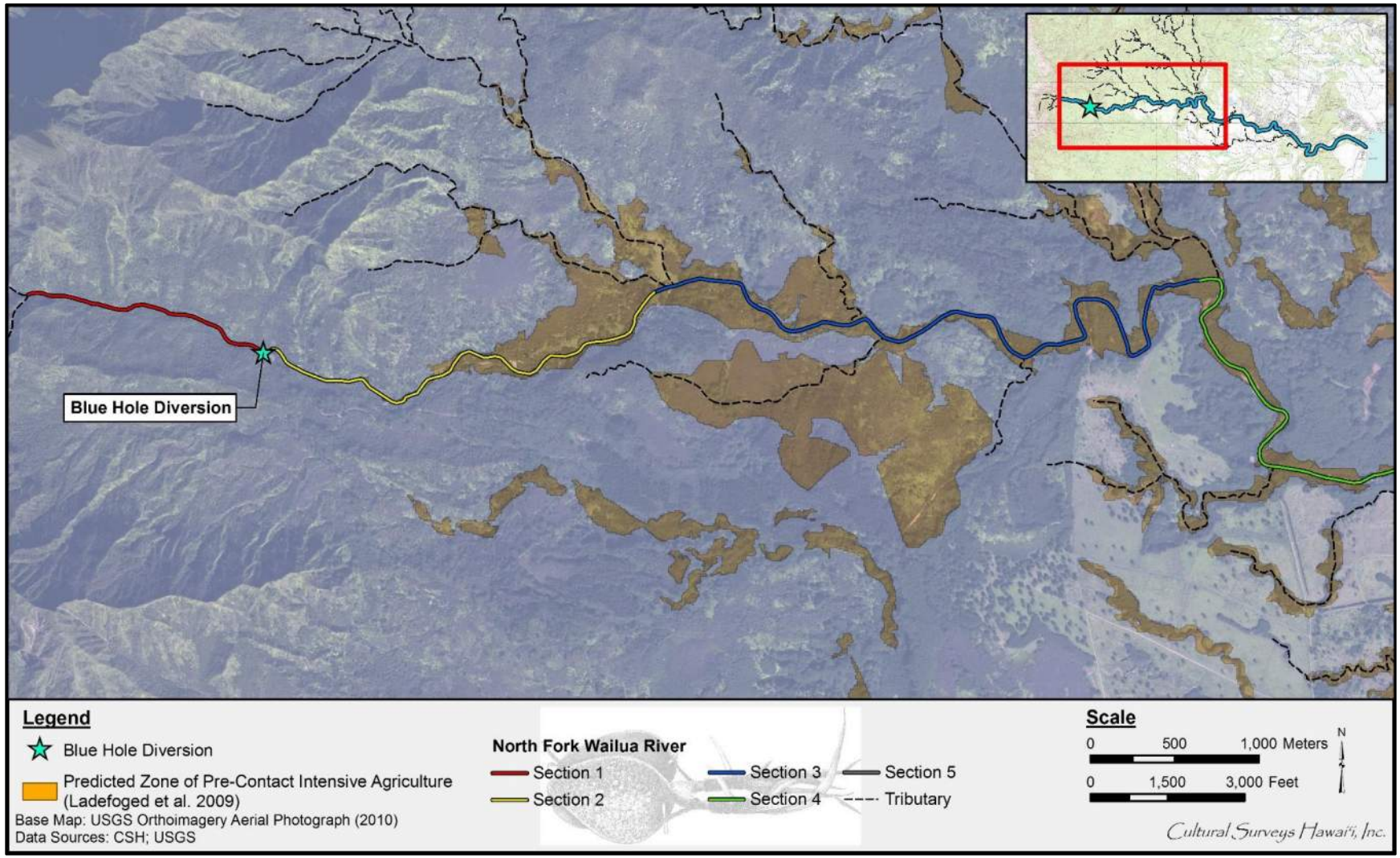

Figure 19. 2010 USGS Orthoimagery aerial photograph showing GIS modeling of the predictive zone of pre-Contact intensive agriculture (Ladefogod et al. 2009) in the upper reaches of the Wailua River

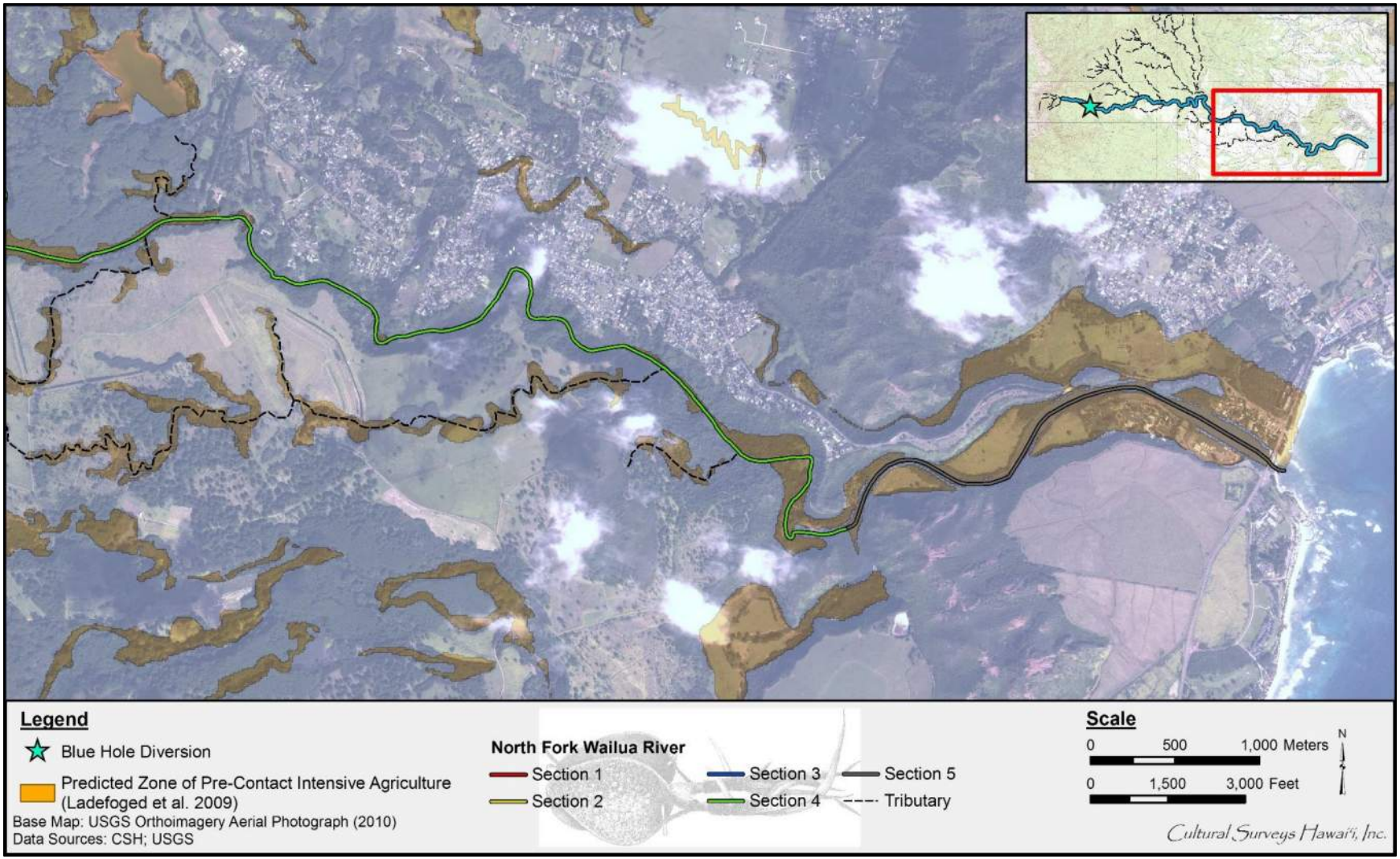

Figure 20. 2010 USGS Orthoimagery aerial photograph showing GIS modeling of the predictive zone of pre-Contact intensive agriculture (Ladefogod et al. 2009) in the lower portion of the Wailua River

Figure 21. Wailua River North Fork, view to west

Figure 22. Typical vegetation in Area 3 north of Wailua River, view to northwest

Figure 23. Dense vegetation obscuring ground surface, view to north

Figure 24. Blue Hole Diversion, view to west

Figure 25. Area *mauka* of Blue Hole Diversion, view to west

Figure 26. Area *mauka* of Blue Hole Diversion, view to southwest

Section 5 Previous Personal Narrative

This section draws from previous personal narrative research highlighting the voice of an individual who grew up in the small plantation community of Hanamā‘ulu in the 1950s. This *mo‘olelo*, written by Jeffrey Agader in 1985, colors the cultural and historical background with nuanced recollections. Figure 27 and Figure 28 depict the topography of Wailua and Hanamā‘ulu Mauka with the project area (red) and the hydropower plants (yellow), respectively.

5.1.1 Jeffrey Agader

HANAMA‘ULU is approximately two miles east of the Kaua‘i County seat of Lihue. It was a small plantation community, consisting of several neighborhoods called camps, typical of the communities that dotted the island of Kaua‘i in the 1950’s.

THE PLANTATION STORE

The store was a small wooden structure. The oiled floors gave it a distinct odor. I remember the butcher counter in the rear where we would watch the beef being ground into hamburger, the bottled sodas that sold for a nickel, the freezer containing the ice cream and popsicles, and the glass display cases on the right containing various sundry items. This is where Mom would shop for household supplies and groceries and charge them to Dad’s plantation bango number 3140.

The store manager was Joe Ferreira, whose son Stephen was a year younger than me. Before Joe Ferreira, the manager was Antone Nobriga. The kids in the camp thought Stephen was fortunate to have a dad who didn’t have to work outdoors. Our dad and most of the people we knew worked outdoors in the sugar fields. Joe Ferreira was one of just a few who worked in-doors away from the hot scorching sun.

A small post office occupied the left-side of the store. Joe Ferreira was the postman too. Everyday, he would sort the mail and put them in the mail boxes. As soon as we were old enough to memorize our postal box combination number, our job was to pick up the mail as we walked home from school. Unlike the postal boxes of today, most of the boxes had windows so you could see if you had mail. Our box number was 272.

Joe Ferreira was envied. His job seemed easy, but probably wasn’t, and besides, he was always nicely dressed in a white shirt and tie. I vowed that I would have a good job like him some day.

THE BARBER SHOP

The barber shop was run by an elderly Japanese gentleman whom we kids only knew as Yaka [Editor’s note: Sojo was the barber’s given name]. The shop had candy-striped cylinders outside the entrance.

Yaka’s was a nice place to hangout. There was always a stack of old comics and magazines for customers. Yaka was friendly and treated us kids well. I recall his

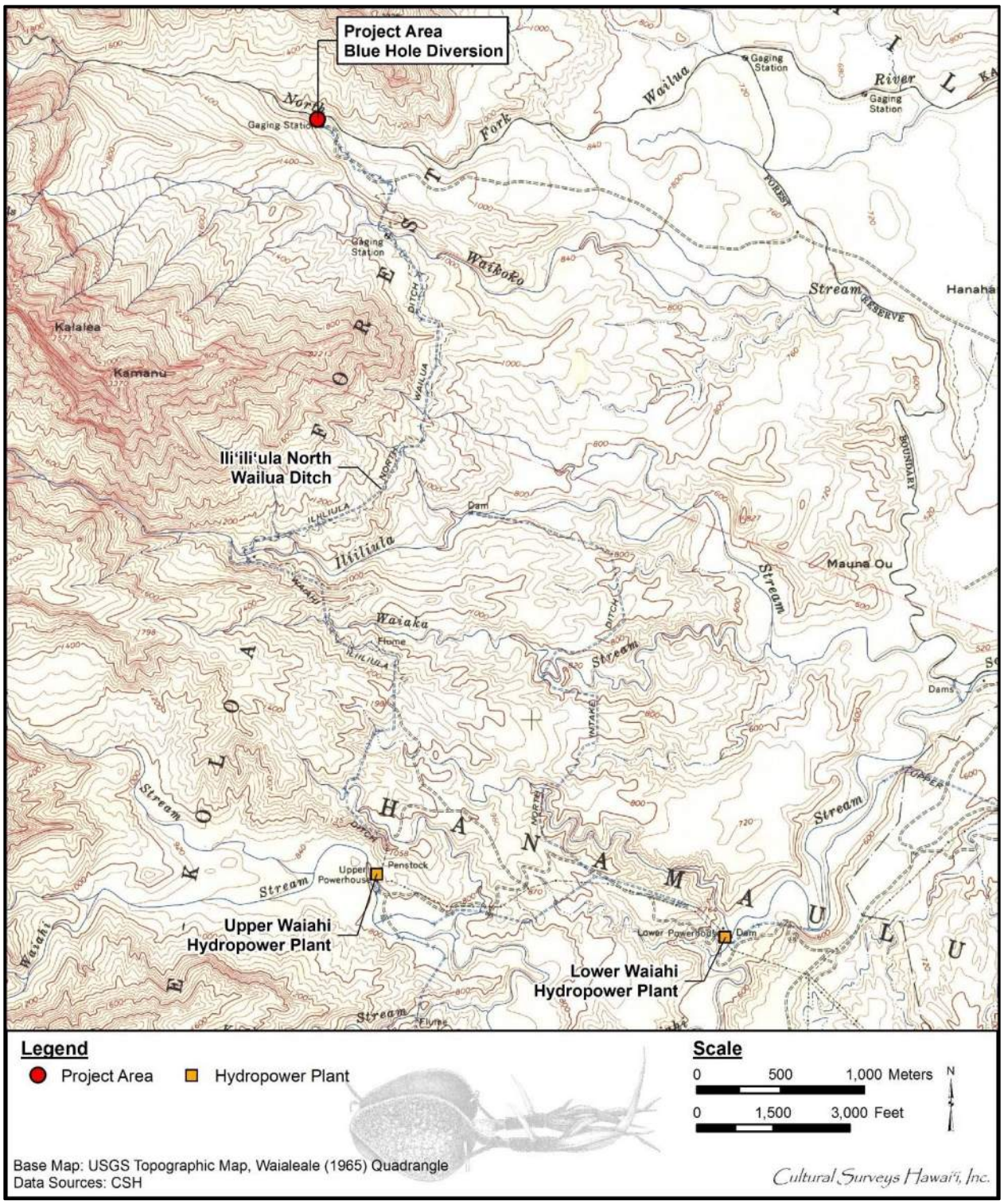

Figure 27. 1965 Waialeale USGS topographic quadrangle, with project in red and hydropower plant in yellow

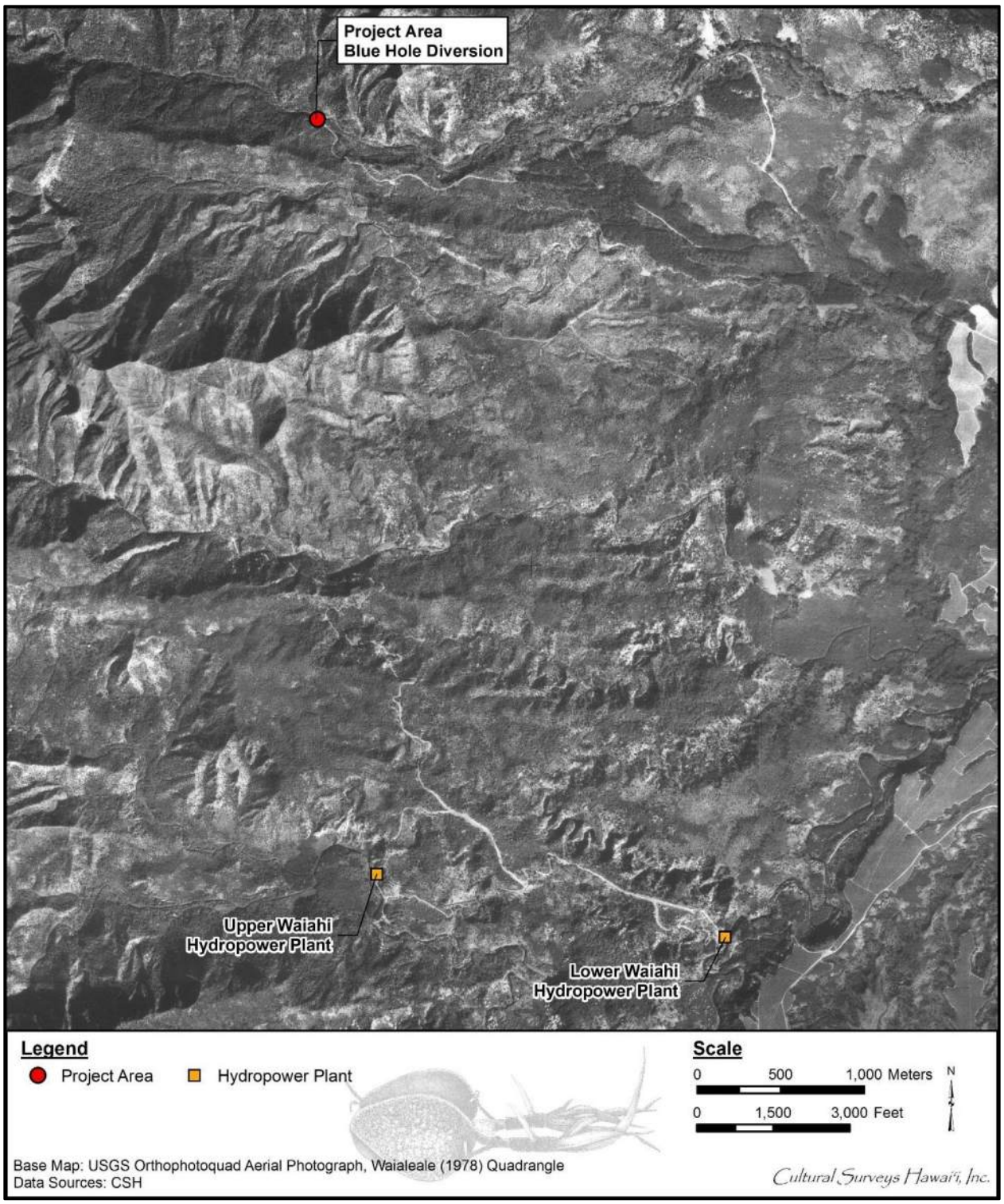

Figure 28. 1978 USGS Orthophotoquad aerial photograph, Waialeale Quadrangle with project area and hydropower plants

stories about a son who was a jockey (horses) in California. He proudly showed us pictures of that son winning races.

My brother Milton and I didn’t go to Yaka for haircuts until high school because Dad had his ‘town mates’ from the Philippines, Resureccion Sanchez and Juan Javonillo, cut our hair. When we eventually went to Yaka, it was ‘big-time’ for us, but Mom never liked it because she thought our hair was cut too short.

Yaka always left his side window open so people walking by could stick their heads in and talk story with him. Kids would also ride up to the window, reach in and grab some comics, and just sit on their bicycles and read. Yaka didn’t mind, he enjoyed everyone’s company.

THE SCHOOL

The K-8 school was small, built in the shape of a ‘U’ with a flag pole in the middle of the open courtyard. Enrollment was only 104 during my eighth-grade year in 1959. Everybody in Hanama‘ulu attended the school or Immaculate Conception School in Lihue. Most of the kids we knew went to Hanama‘ulu School.

We loved to go to school early to play and talk story. Play was mostly running barefoot playing a game we called ‘master.’ At the first bell, everyone had to stop to pick up rubbish. Then at the second bell, the entire school was required to stand at attention in formation grouped by grades as the flag was raised, a bugle played, and the Pledge of Allegiance recited.

At the end of the school day, we would go through the same ritual of picking up rubbish and standing in formation as the flag was lowered. Then those on cleanup duty swept the classrooms, emptied the trash, wiped the chalk boards, and cleaned the chalk erasers.

The cafeteria was staffed by Mrs. Jerves, the manager, and another lady whose name I can’t remember. Sometimes Mrs. Marques, the janitor, would help out. The rest of the crew consisted of students. I recall dreading cafeteria duty—peeling onions, washing pots and pans, and mopping floors. It was hard work.

Because enrollment was so low, grades were grouped. The third and fourth graders were grouped in a single classroom . . . so were the fifth and sixth graders, and the seventh and eighth graders. Maybe this is why the kids in Hanama’ulu were always a close-knit bunch.

The teachers were great, mostly young, probably in their 20s and just out of college. Several lived in cottages on campus so it wasn’t unusual to see them after school, on weekends, and during the holidays. Two teachers, Art Fung and Albert Nagata, would drive us to the Library in Lihue and also take us on weekend hiking trips and camping outings. All of the teachers were like ‘family’—so different from today.

A BLEND OF CULTURES

Our family always seemed a bit different from other families because Dad was from the Philippines and Mom was a Nisei—a second generation Japanese. Interracial

marriages were not common in those days. Mom said she first saw Dad when she accompanied a friend who was selling liquor to the single men in the camp. She later met Dad at a carnival, saw each other for a while, and then eloped to get married.

We only knew one other kid of mixed nationality, Clyde Iloreta. Like Dad and Mom, Clyde's father was from the Philippines and his Mom was Nisei. We spent many hours at Clyde’s house reading comics, looking at baseball and football cards, shooting hoops, and listening to major league baseball over the radio. Clyde always had a lot of comics and toys.

Unlike most households in the camp, English was the only language spoken at home. Mom never learned Ilocano. Dad never learned Japanese. Both probably felt that English was more important for us kids. Looking back, it would have been great if we had learned both languages.

Mom and Dad adjusted to each other’s culture. Mom learned about Filipino foods. Dad learned certain Japanese customs. They always taught us to be proud of both cultures. It wasn’t until many years later that we began to meet other people from interracial marriages.

BEHIND THE GAS STATION

When you worked on a plantation, you had no choice of living quarters. Housing was owned by the plantation and seemed to be assigned based on race and job status. Filipinos seemed to have the worst housing. On the other hand, the Portuguese families seemed to be grouped in newer and bigger homes, which sometimes overlooked the rest of the community, probably because they held the better jobs—*luna* or bosses. The Japanese were few, but their housing seemed to be better than those assigned to the Filipinos.

Many years later, at a sociology class at the University of Hawaii at Manoa, I learned that housing was segregated because the plantations wanted to ‘control’ the workers. They believed that the workforce could be more productive if kept segregated.

Our first house was located behind a gas station. It was on a border that separated the Filipino and Portuguese camps. It was a typical plantation-style home with an outdoor toilet and porches in the front and back. The house was old and unfurnished, except for a radio. Rent was $14.25 a month. Before moving in, Dad agreed to pay $50 to the previous tenant for a recently built room addition.

Our neighbor to the right was the Jerves family. Mr. Jerves was a mechanic for the plantation. Mrs. Jerves was the school’s cafeteria manager. The Jerveses had three children—Wayne, Russell, and Mary Ellen. They were about the same age as Karen, Milton, and me but we hardly knew them. When people are segregated, there are few opportunities for interaction, even among the children. We attended different schools—we went to Hanama‘ulu School; the Jerves kids attended Immaculate Conception School in Lihue, where the students were predominantly

Portuguese. It was only years later that we got to know and talk with the Jerves kids, but only occasionally.

Lorenzo Comilang and his three children—Teofilo, Simproso, and Teresa—were the neighbors to our left. Like all other Filipino immigrant workers, Mr. Comilang was a laborer for the plantation. His younger son, Simproso, nicknamed Simin, was a few years older than us. Simin had a reputation for being a ‘lady’s man.’ He was tall, handsome, and he could sing all the popular songs of the time. We went to his house often to read his ‘Hit-Parade’ magazines and to hear him sing. We always thought Simin would become a professional entertainer.

There was a dirt road fronting our house and fields of sugar cane in the back. We spent countless hours on the front road. It was our playground. It was also the road we walked to and from school. Along that road lived all the people we grew up with—Tomacder, Cadawas, Valmoja, Baldemor, Sarita, Alayvilla, Quel, and Cruzada. The houses were built close together, all with front porches so we always saw the neighbors.

We lived in the house behind the gas station from 1941 to 1955.

DAILY LIFE

Living on a plantation was OK for us kids. There was always something to do.

We’d sit for hours in front of the store, counting the cars going by to see whether there were more Chevys, Fords, Plymouths, or Dodges. Everybody wanted to pick Chevys so we’d always argue. No one wanted the Plymouths and Dodges. The Chevys always won.

Kalepa, the small mountain overlooking Hanama‘ulu, was a popular playground. One day it was a fort; the next day, a World War II battleground. Another day, it was an African jungle. Kalepa was covered with ironwood trees and lantana brush. From the top, you could see all of Hanama‘ulu, including the bay where ‘Donovan’s Reef,’ starring John Wayne, was filmed. When Milton and Karen were attending college in Colorado, I used to climb to the top to think and reflect. Today, it always makes me feel relaxed to imagine myself sitting on the top of Kalepa looking down at Hanama‘ulu and the ocean.

Our daily chores revolved around tending the vegetable garden, mowing the lawn, and caring for a few pigs and a cow.

Dad was good at gardening. We planted *tarong* (eggplant), lima bean, *paria* (bittermelon), *otong* (long beans), *maronggay* (horse-radish tree for its leaves and fruits), *katuday* (a tree with white flowers), pumpkin, squash, sweet potato, tomato, lettuce, head cabbage, won bok, bell pepper, green onion, broccoli, and chili pepper. The garden was a never-ending chore of planting, weeding, and watering. It wasn’t always fun, but it felt good to watch the seedlings grow into healthy plants.

Growing vegetables was almost a necessity. The store in Hanama‘ulu sold only round onions, potatoes, and carrots. The only other place where we could buy vegetables was from an old Japanese man who peddled his vegetables from a truck.

Once a week, he would drive through the camps, tooting his horn and stopping every few hundred yards. The adults joked that the peddler’s vegetables always looked so good because he used manure for fertilizer. Mom purchased from the peddler only when it was a necessity. We usually grew whatever we needed.

LEARNING TO GOLF

My first exposure to golf was from watching Stephen Ferreira’s older brother. He showed up at the park one afternoon to hit balls. A bunch of us kids gathered to watch in amazement. Ball after ball, Stephen’s brother hit it so far it seemed unbelievable. Up to that time, the farthest we saw anyone hit a ball was Paul Carvalho. Paul played softball in the plantation league and he would consistently hit balls nearly out of the park. But Stephen’s brother easily hit the golf ball twice as far, out of the park and into the cane fields that bordered the east-side of the park.

Later, when I was 10, a plantation carpenter, Kazu Iwasaki, got us interested in caddying at the Wailua Golf Club. It was fun and the pay was good too. We would hitch hike to the course on weekends, caddy for 18 holes, then hitch hike back home. The pay was $1.75, enough to pay for movie tickets at the theater in Lihue.

The local pro was Toyo Shirai. Before him, the pro was the legendary Guinea Kop. When the course was not busy, Shirai would give the caddies golf lessons. He also sponsored tournaments and putting contests for us kids. I won the under 12 tournament in 1956 by shooting a 52 and 61 for 18 holes. The kids in Hanama‘ulu used to make fun of us. Golf at that time was known as a rich man’s sport as well as a ‘sissy’ sport.

In 1958, we had a new teacher at school, Albert Nagata. He was new to Kauai. When he learned that I played golf, he asked if I would play with him after school. I recall playing with him once or twice at Wailua. I can’t remember if I beat him.

At age 14, I stopped paying, not by choice. It was time to work at a real summer job, in the pineapple and sugar cane fields.

SUMMER JOBS

All the kids in Hanama‘ulu worked during the summers. The boys picked pineapples or worked in the sugar fields, while the girls toiled in the pineapple cannery in Kapaa as trimmers or canners. I ‘lucked-out’ at age 16 when I got my first indoor job, working as a janitor and stock-clerk for the Kress store in Lihue.

FISHING WITH DAD

Dad enjoyed fishing, and he would take us often, sometimes to catch mullet in the fresh water ponds above Wailua, most of the time to lay small opae (fresh water shrimp) nets at night in the Hanama‘ulu River.

When fishing for opae, we’d lay more than a dozen round nets about 25 yards apart. Each net would be attached to a long wooden pole that would be used to lift the net out of the water. The bait was a paste-like mixture of water, flour, and middling that was placed on a heavy stone in the center of the net. My job was to hold the

supply of bait and shine the flashlight as Dad and Milton lifted the nets out of the water and removed the opae. When our bucket was about a third full, we'd call it quits. Dad enjoyed eating the opae raw, flavored with lemon juice. I could eat it only if it was fried.

Dad also liked to fish in the mountain streams behind Kalepa. Once he took us fishing in the stream below the Wailua Falls. He brought along salt, tomatoes, and rice, and we cooked what we caught. As with other fishing outings, he brought along a cane knife that day. I remember asking him what the knife was for, and his reply was 'to chase the ghosts away.' I believed him.

We also fished for blue gill in the small reservoir behind Kalepa. We used worms or bread for bait. I preferred bread because I could never comfortably put the hook through the live worms. We usually stayed for hours just to catch a few fish. Mom would fry the catch for dinner. We liked them fried crispy brown. That way, we could eat the bones too.

POCKET KNIFE

Just about every kid in Hanama‘ulu eventually owned a pocket knife, with at least four blades—a large blade, a small blade, a blade for digging, and a bottle opener.

The knives were handy for all sorts of things. We'd cut branches from the hao tree to carve small toy canoes. The bark from the long skinny branches would be braided into long whips. We carved wooden propellers, made holes through the middle, and then attached the propellers with nails.

We used the knives to cut sugar cane stalks to chew, and sucked the sweet cane juice. We also used it to fashion arrows from the cane tassels, bows from bamboo, and quivers from cardboard. We made slingshots from guava branches, horns from young coconut leaves, pea-shooters from clothes pins, blow-shooters from papaya stems, miniature tractors from thread spools, rubber guns from scrap lumber and old tire tubes, whips from hau bark, and swords from branches of panax hedges.

In retrospect, the pocket knife helped in ways that I only comprehended later in life. I now realize that using the knife to make toys required planning, organization, and an abundance of patience. The things we made as kids often took days and weeks to build. And once made, it wasn't easily discarded or ignored as is often done with today's toys. Today, when Kern and Dana want something, they buy it from a store. It involves a different kind of planning. I'm not sure it involves organization, but it does provide them instant gratification. So different from our Hanama‘ulu days.

CHRISTMAS AND NEW YEAR

The year-end holidays in the 1950s were different than today because of the serenading. People would visit unannounced and sing Christmas carols. We'd gather on the porch to listen, and Mom would give the serenaders money or food. When we were older, we formed our own group, accompanied by Peter Adolfo, the school custodian. Peter looked pure Hawaiian to us kids, but with a name like Adolfo, he probably wasn't. Peter could sing and play the ukulele. Serenading with

Peter was fun. I think we kids did it for the money, not the food. And no matter how badly we sang, people seemed to enjoy being serenaded.

Christmas was also different because of the annual Christmas play put on by the school. It was a big production with props, costumes, music, and makeup. Those who couldn’t act were assigned to the chorus. I usually was in the chorus, but one year I managed the stage—props and lighting. The play was always the big Christmas event for Hanama‘ulu. We’d begin to rehearse and get the sets and props ready in October. Alice Wedemeyer, the school principal, was the producer, director, and musical conductor. I can still picture her pounding the piano during rehearsals and getting frustrated with us for singing off-key. Most of us disliked the rehearsals, and we could never understand the educational value of spending so much time on the play. But Mrs. Wedemeyer did teach us to take pride in whatever we did.

Midnight church services were a regular ritual for us on Christmas Eve. On Christmas morning, we opened presents together. We got the usual toys—trucks and guns for Milton and me, and dolls for Karen. Several weeks before Christmas, Mom would give us money to shop by ourselves for presents for her and Dad. We usually bought cigarettes for Dad, and handkerchiefs, towels, and pillowcases for Mom. Mom and Dad would always tell us the presents were just what they wanted and needed—it always made us feel good. When we were very young, we bought the presents from the store in Hanama‘ulu. As we got older, I recall shopping for gifts at Kress and Kawakami Store in Lihue. We always shopped together to buy presents for Mom and Dad.

New Year’s Eve was noisy and bright. There were no restrictions on fireworks. Roman candles and flash bombs were prevalent. Cherry bombs were also available, but only the adults and older kids used them. The young kids played with the smaller firecrackers, lighting them one at a time to make them last past midnight. Some of our Filipino neighbors had their own way of making noise—they made cannons out of large bamboo and used kerosene as fuel. It was fun time for everyone, with neighbors and friends exchanging food and hospitality.

When the celebration was over, the kids would salvage the powder from unexploded firecrackers to make homemade explosives. We’d insert a fuse at the bottom a flash bomb container, pour enough powder to cover the fuse, and pack the container tightly with newspaper. Then the bravest kid would light the fuse while the rest of us hid. Surprisingly, nobody ever got hurt.

RELIGION

Growing up in Hanama‘ulu meant going to church on Sundays and attending weekly religious education classes.

Our family regularly attended church services at the Immaculate Conception Church in Kapaia, although Dad rarely attended. Mom said that Dad was uncomfortable because he felt that many people went to church to see who was there and how they dressed.

We always had an altar at home. I recall several times when our family prayed together at the altar—it could have been when Mom had insomnia or when Dad was staying out late playing cards.

Mom and Dad taught us to pray before going to bed at night. Sometimes we’d also go to confession on a Saturday afternoon, then receive communion the next morning. After Sunday mass, Mom would make us pancakes for breakfast. I also recall walking home from Church, and our shoes would get dirty when it rained because there were no sidewalks.

CHILD GAMES

The games we played were simple. We learned from the older kids and passed them on to the younger ones.

We played the usual army games. One side was the Germans and Japanese while the other side was the Americans. The rifles were handmade and wooden. The bullets were large rubber bands made from old tire tubes.

We learned hopscotch from the girls. The lines would be drawn on the dirt road fronting our house. Karen and her friends Nina Cadawas and Remy Alayvilla always won.

The girls taught us jacks. The best player was Nina Cadawas.

Marbles were very popular. The best known game was ring. A large ring would be drawn on the dirt. Players would wager a designated amount, usually three marbles. The marbles would be grouped in the center of the ring. Players took turns shooting from behind the ring, and they got to keep the marbles they managed to shoot out of the ring.

Other marble games were fish and holes. In fish, a fish was drawn in the dirt and marbles would be placed within the fish. Players would take turns shooting the marbles out of the fish from behind a designated line. In holes, a series of holes were dug in the dirt. The object was to shoot your marble into the holes in a designated sequence.

One game that took hours to play was Throw-the-Can. A can would be thrown as far as possible, and while a player was retrieving the can, the others would hide. The player retrieving the can would place the can in an open area, and while guarding the can, search for the others. If he located a person hiding, he’d have to run back to the can and touch it before the other player did. If the player hiding was able to touch the can first, he would throw the can and the game would continue.

OUTDOOR TOILET

Our house behind the gas station had an outdoor toilet, which was a small wooden shed located away from our back porch. The shed was dark and musty, and full of spiders and lizards. I remember using matches to burn the cobwebs. The toilet seat was a bench with a round hole in the middle. I can’t remember if we had toilet paper. I do know that there was always a stack of old magazines or newspapers

nearby. Once or twice a day, the plantation would divert water from the irrigation ditches to flush the waste away . . . I’m not sure to where, perhaps into the river near Hanama‘ulu Bay. In 1955, we moved to a Punchbowl house on the slopes of Kalepa that had an indoor toilet. The house was formerly occupied by the Travaso family, headed by Joe Travaso who was the plantation camp police.

WATER HEATER

Our water heater at the Punchbowl house was made by one of Dad’s friends, who were a welder. It consisted of metal cylinders welded at right-angles to each other. The horizontal cylinder held the firewood, the base of the vertical cylinder stored the water, and another interior vertical cylinder served as the smoke stack. The heater was near our back porch adjacent to a bath house which also served as a laundry room. Firewood was from fallen ironwood trees on Kalepa. We’d gather the dead trees, drag them to our back yard, and saw and split them with an axe into the proper size. We used old rags dipped in a flammable solvent (probably discarded diesel oil) to start the fire. The water would be steaming hot in less than thirty minutes. [Agader 2004]

Section 6 Community Consultation

6.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian Organizations (NHO), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupua‘a* of Wailua and Hanamā‘ulu. CSH initiated its outreach efforts in May 2017 through letters, email, telephone calls, and in-person contact. CSH reopened consultation per client's request in Novemeber 2018 via email, telephone, and sit-down interviews. CSH completed the community consultation in December 2018.

6.2 Community Contact Letter

Letters (Figure 29 and Figure 30) along with a map and an aerial photograph of the project area, were mailed and emailed with the following text:

> At the request of The Kaua‘i Island Utility Cooperative (KIUC), Cultural Surveys Hawai‘i, Inc. (CSH), is conducting a cultural impact assessment (CIA) for the proposed Blue Hole Diversion Long Term Lease Project, Hanamā‘ulu and Wailua Ahupua‘a, Līhu‘e District, Kaua‘i Island, Tax Map Keys (TMK): Multiple.
>
> KIUC applied for a 65-year lease to use water emanating from State lands and collected water from Waikoko Stream and the North Fork of the Wailua River (referred to as the "Blue Hole Diversion") for the purpose of continuing to operate two of KIUC's hydroelectric plants.
>
> In 2006, a Memorandum of Agreement (MOA) between KIUC and the Office of Hawaiian Affairs (OHA) was issued with the condition of a cultural impact study be conducted for the issuance of the long-term lease. The MOA states that OHA may object—based on the CIA—to the Board of Land and Natural Resources (BLNR) issuance of a long-term lease. The purpose of the study is to detect if there are any cultural practices occurring with the project area and whether or not the proposed activity will affect these practices.
>
> The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assist us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:
>
> - General history and present and past land use of the project area.
> - Knowledge of cultural sites –for example, historic sites, archaeological sites, and burials.

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

399 Hualani Street, Suite 124 **Hilo, Hawai‘i 96720** **Ph: (808) 965-6478** **Fax: (808) 965-6582**

Job code: WAILUA 35 nishihara@culturalsurveys.com www.culturalsurveys.com

June 2017

Aloha,

At the request of The Kaua‘i Island Utility Cooperative (KIUC), Cultural Surveys Hawai‘i, Inc. (CSH), is conducting a cultural impact assessment (CIA) for the proposed Blue Hole Diversion Long Term Lease Project, Hanamā‘ulu and Wailua Ahupua‘a, Līhu‘e District, Kaua‘i Island, Tax Map Keys (TMK): Multiple.

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The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assist us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites –for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama‘āina* (Native-born) who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* (traditional land division extending from the mountains to the sea) lands.**
- **Any other cultural concerns the community might have related to cultural practices within or in the vicinity of the project area.**

Figure 29. Community consultation letter, page 1

WAILUA 35 – CIA for the KIUC Blue Hole Diversion Long Term Lease Project

Page 2

Please contact Nicole Ishihara, at (808) 965-6478, or send me an e-mail at nishihara@culturalsurveys.com if you have any information you would like to share.

Me ka ha‘aha‘a,

Nicole Ann Nāhōkūlaniahiahi Ishihara
Project Director & Cultural Researcher
Cultural Surveys Hawai‘i

Figure 30. Community consultation letter, page 2

- Knowledge of traditional gathering practices in the project area, both past and ongoing cultural associations of the project area, such as legends and traditional uses.
- Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* (traditional land division extending from the mountains to the sea) lands.
- Any other cultural concerns the community might have related to cultural practices within or in the vicinity of the project area.

6.3 Community Contact Table

Table 1 contains names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order.

Table 1. Results of community consultation

Name	Affiliation	Comments
Ahuna, Dan	Kaua‘i and Ni‘ihau Trustee, OHA	Letter and figures sent via email 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Aipa-Rivera, Thompson	*Kama‘āina*, Cultural practitioner	CSH met with Mr. Aipa-Rivera on 20 July 2017 on a *huaka‘i* (journey, trip) to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a Letter and figures sent via email on 25 July 2017 Follow-up email regarding sending intial letter with figures and submitting testimony on 7 August 2017 Mr. Aipa-Rivera emailed CSH on 17 August 2018 stating he would submit testimony the following day and apologized for the delay
Albao, Liberta Hussey	President, Queen Deborah Kapule Hawaiian Civic Club	Letter and figures sent via email 9 May 2017 Ms. Albao replied via email on 9 May 2017 with the following statement: *Mahalo Nicole I appreciate the information and will forward to all the members of the Queen Deborah Kapule Hawaiian Civic Club. This is of great concern and will discuss this at our next board meeting.* *Liberta Hussey Albao, Pelekikena*
Ako, Val	*Kama‘āina* of Wailua	Letter and figures sent via USPS 9 May 2017 Letter and figures returned on 14 May 2017
Asquith, Adam	Cultural practitioner	Referred to CSH by OHA; Hope Kallai sent documentation of a complaint filed by Mr. Asquith

Name	Affiliation	Comments
		Letter and figures sent via email on 31 August 2017 CSH called Mr. Asquith on 25 September 2017; left a voice mail
Blake, Ted	*Kama‘āina*	Emailed CSH on 17 July 2017 asking about context of email forwarded to him from Hope Kallai CSH responded to Mr. Blake via email on 17 July 2017 clarifying the function of the CIA and the schedule for the 20 July 2017 group consultation and *mauka* fieldtrip Mr. Blake emailed CSH on 17 July 2017 the following: *FYI.* *These are some names that will be in the audience on Thursday:* *Phoebe Eng, Gary Hooser Malia Chun, Kawai Warren, Representative Dee Morikawa, Mehana Vaughan, Laurel Brier, Carol Lovell, Rob Brower, Felicia Alongi Cowden, Bonnie Asquith, Adam Asquith,* [Josephine Bonaparte], *Shane K Cobb Adams, Dan Ahuna,OHA TRUSTEE, Kanoe Ahuna (wife of Dan), Nalani Mahelona, Jennifer Van Gorp.* Mr. Blake called CSH on 18 July 2017 and left a message; CSH returned Mr. Blake’s call and left a message; Mr. Blake returned CSH’s call and discussed the background of the project Mr. Blake attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 Mr. Blake called CSH on 26 July 2017 to debrief regarding the 20 July 2017 community meeting at the Kaua‘i County rotunda
Bonaparte, Josephine	*Kama‘āina*	Ms. Bonaparte called CSH on 24 July 2017 and stated she is not OK with a long-term lease, maybe a month-to-month revocable lease, feels 65 years is really long; personally likes free-flowing water; plantations used water for crops but today they no longer have plantations; pointed out there are farmers in Kealia that don’t have water or difficulty accessing water, not sure if it has anything to do with the water diversion or not; stated that the water diversion will affect others

Name	Affiliation	Comments
		(fishermen, gatherers); is concerned about how aquatic life will be affected that does not have free-flowing water Ms. Bonaparte emailed CSH with a written statement on 27 July 2017: *I thank you for taking my call the other day.* *I had mentioned I was not able to attend your meeting at HA Coffee in Lihue and address my concerns regarding KIUC and their request for a 65 year lease to divert water from Wailua over to their project in Puhi.* *I am opposed to this request.* *I am opposed to the Water Diversion. I say let the water now run free.* *I wanted to attend the walk with you folks but had Hula Practice.* *I understand the water was flowing more than it had been. Possibly due to the rains or someone opened up the flow to make it seem like downward areas would not be highly affected with the diversion.* *I am not a cultural practitioner but have much respect for anyone who cares for the Wai and its harmonious balance in nature. The many fish and aquatic life that seems doomed with diversion, drying up and dying off life forms at are important to our eco-sysmtem* [sic]. *I think if anything is to be granted a month to month revocable permit. Although I too would prefer none.* *I am* [a] *member of KIUC.* *I do not feel they are doing what is best for the Aina, but instead what is best for profits.* *I do not see much of any kind of distribution of profit sharing from them.* *I am not a scientist and I am not apt in solar and what other projects they have but I don't see any benefits except that which lay in their own pockets.* *I am a fan of Solar, just not a fan of taking more from the land than we give . . .*
Cayan, Coochie	Intake Specialist, SHPD	Letter and figures sent via email 15 June 2017

Name	Affiliation	Comments
Ching, Milton	Archaeologist, Cultural practitioner, *kama‘āina*	Referred to CSH by OHA Letter and figures sent via email 31 August 2017 Mr. Ching responded via email on 1 September 2017 stating he would review and work on request over the weekend CSH emailed Mr. Ching on 5 September 2017 following up on his review and reply
Chock, Mason	Councilmember	Mr. Chock called CSH and left a message on 15 August 2017; CSH returned Mr. Chock’s phone call on 16 August 2017 Mr. Chock wanted a status update on the CIA (if it was still ongoing or submitted to OHA; if there was a lot of community response); Mr. Chock requested to be updated if anything came up for this specific project and said that in the future he would like to be updated on contentious projects
Cody, Nicole Hoku	*Kama‘āina*, Marine Biologist	Ms. Cody attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 Phone interview scheduled for 24 July 2017; rescheduled for 25 July 2017 Phone interview on 25 July 2017 Draft summary sent to Ms. Cody on 28 July 2017 for review Follow-up email sent regarding review and editing of draft summary on 7 August 2017 Second follow-up email sent regarding review and editing of draft summary on 16 August 2017 Ms. Cody emailed CSH on 13 September 2017 apologizing for the delay and sent in edits to her summary CSH emailed Ms. Cody on 19 September with a revised summary for her to review Ms. Cody emailed CSH on 20 September 2017 with her final edits to her summary; Ms. Cody’s interview can be found in Section 7.1
Cowden, Felicia	Kaua‘i radio host and educator at Akamai Learning	Ms. Cowden attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Letter and figures sent via email on 24 July 2017 Follow-up email regarding sending intial letter with figures and submitting testimony on 7 August 2017

Name	Affiliation	Comments
		Ms. Cowden responded to CSH via email on 9 August 2017 stating she will be submitting her observations from 20 July 2017 soon; also reported a recent death in the Kaua‘i community has effected the “young kia‘i team” that CSH met in Wailua Mauka, which may affect response time regarding personal testimonies/statements CSH emailed Ms. Cowden on 9 August 2017 sending condolences and thanking her for her *mana‘o* Ms. Cowden submitted testimony via email on 17 August 2017 (see Section 6.8 for Ms. Alongi Cowden’s personal testimony)
Crabbe, Kamana‘opono	Ka Pouhana, OHA	Letter and figures sent via USPS 9 May 2017
Else, Jessica	Journalist, *The Garden Island*	Ms. Else emailed CSH with the following on 17 July 2017: *I’m a journalist with The Garden Island Newspaper—and I’ve received an announcement (below) that you'll be on Kauai talking with folks about the impacts of the KIUC 65-year lease on the North Fork Wailua River, Waikoko, Iliiliula, Waiaka and Waiahi Streams, Puna District, Kauai. I’d like to tag along during your chats with folks at Ha Coffee, and I’d like to go to Blue Hole with you as well, if that’s feasible.* *I’m wondering about timing—what day/time are you going to Blue Hole and when would be best for me to meet you at Ha and get a good feel of the conversation you’ll be having with the community?* CSH called and left a message for Ms. Else on 17 July 2017; Ms. Else returned CSH’s call that day; CSH stated we’re conducting a cultural impact assessment and that we are collecting *mana‘o* and *‘ike* from the community; would prefer to not run in the paper
Esaki, Godwin	Farmer, Wailua Ahupua‘a	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Forrest, Devin Kamealoha	*Kama‘āina*	Referred to CSH by Nicole Hoku Cody; due to time constraints CSH was unable to contact

Name	Affiliation	Comments
Frederick, Anne	Executive Director, Hawai‘i Alliance for Progressive Action (HAPA)	Ms. Frederick attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Ms. Frederick contacted CSH via email on 8 August 2017 with the following questions: *It was nice to meet you at the visit to the north fork diversion of the Wailua River on Kaua‘i. Can you please let me know when testimonies are due, and if you have received several from our group that visited the intake that day?* *Also, I'm wondering if you can clarify what the next steps are? Is there a draft that the public can review? What is the process for the public and cultural practitioners to follow in terms of how their input is being integrated into the process?* *I understand you are on somewhat tight timeline, so your feedback in our how our community can best stay engaged and informed is very appreciated.* CSH responded to Ms. Frederick via email on 8 August 2017 stating that we are asking people to send in their testimonies as soon as possible so we have time to process everyone's *mana‘o*. CSH also gave Ms. Frederick guidance on what testimonies should include (i.e., background of individual/personal information; memories of the project area; *mo‘olelo*; sites including *heiau*, burials, trails, etc.; cultural practices of the area; how cultural practices will be impacted by the proposed project; concerns, affects, recommendations/mitigation proposal, referrals) and attached a letter and figures for reference
Gilmore, Kyle	*Kama‘āina*	Mr. Gilmore attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Mr. Gilmore emailed CSH on 18 August 2017 asking if he could still submit a personal testimony; CSH replied to Mr. Gilmore via email the same day saying it was fine to submit personal testimony within the next few days and to include the following: "a short intro of yourself (name, where you're born, where you live currently, parents, and your connection to Wailua and

Name	Affiliation	Comments
		Hanamaulu Ahupua‘a), knowledge of the project area (if you know of any legends, myths, heiau, pohaku, burials, trails, gathering practices of the area), and how the project will impact you (if you hunt, gather, fish, etc. how does the project potentially affect your cultural practices). If you have any recommendations or referrals, I am open to hearing that as well.” Mr. Gilmore responded to CSH via email on 23 August 2017 apologizing for the delay and asked if he could still submit testimony. CSH replied to Mr. Gilmore via email on 24 August 2017 stating to send his testimony the same day (see Section 6.10 for Mr. Gilmore’s personal testimony)
Hanohano-Smith, Kamealoha	Wailua Representative, ‘Aha Moku Council *Kama‘āina*, cultural practitioner	Mr. Hanohano-Smith called CSH on 15 May 2017 asking for the status of the CIA with Ms. Kehaulani Kekua. CSH asked if Mr. Hanohano-Smith would be interested in participating in the consultation process for the ongoing CIA with CSH. Mr. Hanohano-Smith said he would get back to CSH. Mr. Hanohano-Smith called CSH on 17 May 2017 and left a message CSH returned Mr. Hanohano-Smith’s call on 18 May 2017. Mr. Hanohano-Smith requested the following: A *huaka‘i* (voyage) to the proposed Blue Hole project area with KIUC, OHA, and CSH Community meeting with KIUC, OHA, and CSH Interview with appropriate parties CSH said they would relay to the client CSH called Mr. Hanohano-Smith on 24 May 2017 to see if he could meet on Kaua‘i; Mr. Hanohano-Smith declined due to a previous engagement; he said he would stay in touch and figure out another date to meet CSH called Mr.Hanohano-Smith on 21 June 2017 and left a message Mr. Hanohano-Smith emailed CSH on 23 June 2017 confirming that he received CSH’s message that he is still interested in participating in the

Name	Affiliation	Comments
		study. He also followed up on a possible site visit and community meeting. CSH emailed Mr. Hanohano-Smith on 23 June 2017 stating that due to time constraints we were unable to secure a site visit and community meeting; Mr. Hanohano-Smith replied to CSH the same day: *No, that is not acceptable. We all have a right to go to this place; as its* [sic] *a very important place to our ancestors. Based on all the information I received from the Kehau, it didn't appear that KIUC had many community meetings or site visits. Also, its* [sic] *still a public site. Its* [sic] *not private and discussions are just starting with DHHL and OHA. As a matter of fact, DHHL just had a meeting on Kauai just the other day. If DHHL and OHA are just beginning to gather our mana‘o, how can this be a closed deal? I don’t think these agencies told us no; I think its just KIUC.* Mr. Hanohano-Smith called CSH the same day and discussed what was sent in our email exchanges; CSH encouraged Mr. Hanohano-Smith to participate in an interview or group interview with interested parties (that he would organize). CSH emailed Mr. Hanohano-Smith on 3 July 2017 to follow up on the possibility of setting up a consultation; Mr. Hanohano-Smith replied the same day to see if any consultations were confirmed, also confirmed he received interview questions from Aunty Puanani Rogers CSH replied on 4 July 2017 stating that no consultations have been conducted or confirmed; CSH gave dates of availability for July 2017; Mr. Hanohano-Smith replied the same day with the following: *What I and others are concerned about are Native Tenant Rights; to insure that these rights are not extinguished. I am concerned about access rights and want to know exactly what is the impact to access, cultural, and natural resources as it relates to cultural, spiritual, and gathering rights. Whatever practices are practiced in other forests, those practices still remain in all forests in Hawaii.*

Name	Affiliation	Comments
		The practices may be specific to Kauai, but the practices still remain. *I will check out our questions but the premise of any proposed activity should start off with the acknowledgment that Native Tenant Rights are codified in law and are to be respected.* *Aunty Punani Rogers is looking for a general meeting right? She is not advocating for individual interviews—that is my take away from her email. I would rather meet as a group.* CSH responded to Mr. Hanohano-Smith via email the same day thanking him for sharing his *mana‘o*. CSH requested that Mr. Hanohano-Smith coordinate with Hope Kallai on behalf of Aunty Puanani Rogers for a group consultation if he’s interested in participating with a group. Mr. Hanohano-Smith emailed CSH on 5 July 2017 stating that he was planning on contacting OHA regarding the project and asked who the contact at OHA was for the project; CSH replied the same day that we were unsure but he could contact the Kaua‘i satellite office or the main office on O‘ahu Mr. Hanohano-Smith emailed CSH on 11 July 2017. He shared that he got in touch with Everett Ohta at OHA and had several questions for CSH. CSH responded to Mr. Hanohano-Smith via email on 12 July 2017 stating that we can set up a meeting for the following week. Mr. Hanohano-Smith called CSH on 13 July 2017 and left a message CSH returned Mr. Hanohano-Smith’s call on 14 July 2017 letting him know that we would be on Kaua‘i facilitating a group consultation on 20 July to 21 July 2017. CSH invited him to the group consultation or gave an option to meet later in the day/evening. Mr. Hanohano-Smith attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 and shared his testimony Mr. Hanohano-Smith emailed CSH on 21 July 2017 asking the following: *Can you confirm the CIS Report Deadline? We’ve been told several things. Hope Kallai keeps telling*

Name	Affiliation	Comments
		us the deadline is July 30, 2017 and that you have to have a report to KIUC and OHA by August 1, 2017. *(I am paraphrasing, so my dates may be off a little, but you get the idea right.)* *Who makes the decision about the deadline? And is this a deadline for a draft? Will OHA come back to beneficiaries to ask questions? I thought at the meeting, our manao would be considered; we were only given a few weeks to contribute manao.* *Surely, CSH understands there are many more Hawaiian practitioners out there who haven't had a chance to share mana'o.* *Can you please confirm for me what Hope Kallai is saying? Also, can you outline what the process looks like going forward, so we have an understanding of what to look forward to in the future and we can get our community ready to contribute, do research, etc.* *Mahalo for any consideration in responding.* CSH returned Mr. Hanohano-Smith's phone call the same day and debriefed from the following days meeting at the Kaua‘i County building CSH emailed Mr. Hanohano-Smith on 24 July 2017 to follow up on submitting his personal statement/testimony, which was submitted the same day (see Section 6.4 for Mr. Hanohano-Smith's personal testimony)
Hashimoto, Danny	*Kama‘āina* and tour operator	CSH contacted Mr. Hashimoto on 20 October 2018; interview set for 5 November 2018 Interview conducted with Mr. Hashimoto and Ms. Sabra Kauka in Līhu‘e, Kaua‘i at Papaya's on 5 November 2018 CSH emailed Mr. Hashimoto a draft of his interview summary on 3 December 2018; approved the same day by Mr. Hashimoto See Section 7.2 for Mr. Hashimoto's joint interview with Ms. Sabra Kauka
Heacock, Donald	Kaua‘i District Aquatic Biologist, Department of Land and Natural Resources	Referred to CSH by Hope Kallai Mr. Heacock called CSH and left a message on 23 July 2017

Name	Affiliation	Comments
	(DLNR), State of Hawai‘i	CSH returned Mr. Heacock’s call on 24 July 2017; was on the road, will call CSH the following morning Mr. Heacock called CSH and left a message on 25 July 2017; CSH returned Mr. Heacock’s call later that day; Mr. Heacock was in a meeting and said he’d call back in an hour
Hermosura, Ka‘imi	*Kama‘āina*	Referred to CSH by Nicole Hoku Cody; due to time constraints CSH was unable to contact
Hiraishi, Ku‘uwehi	Hawai‘i Public Radio	Ms. Hiraishi called CSH on 9 August 2017 asking if CSH wanted to discuss the KIUC Blue Hole Diversion Long Term Lease via radio to solicit input; CSH declined
Ho‘okipa Network		Referred by Ka‘ahiki Solis, SHPD Letter and figures sent via USPS 22 June 2017 Letter and figures returned on 3 July 2017
Huff, Kaiulani	Cultural practitioner	Letter and figures sent via USPS 9 May 2017 Letter and figures returned 14 May 2017 Ms. Huff sent testimony via email on 8 August 2017: *Please accept my opposition to KIUC’s proposed 100% water diverting of the Wailua River’s North Fork to support 100 + year old technology.* *The water belongs to the Kanaka Maoli people, diverting it is a Federal crime and also violates International law-The UN Declaration on Indigenous People which the US thru Pres, Obama signed in 2010.*
Ida, Ron	Royal Order of Kamehameha, Kaumuali‘i Chapter No. 3	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Jackson, Debbie	*Kalo* farmer, lives on *kuleana* land in Hā‘iku	Ms. Jackson attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 and shared his testimony Letter and figures sent via email on 24 July 2017 Follow-up email sent on 7 August 2017 Ms. Jackson emailed CSH on 22 August 2017 with her personal testimony: *I begin by telling you that the mana ikaika of Waialeale is a force to be reckoned with. The heiau dedicated to IO right in front by the triangle*

Name	Affiliation	Comments
		is a testament to its worth. There is no other heiau like this in all these islands. My family, my ancestors know this and have ultimate respect for this. It hurts my naau to have to reveal this ike to you. You are forcing my naau to hurt. The water from Waialeale is sacred. There are sacred chants and oli describing the sacredness. I come from a long line of kahuna who have passed this ike down. The taking of all of the water and not returning it to the stream of origin is in complete disregard of the spiritual nature of this place. There is emptiness in my soul. It is hewa. It is against the highest law, Akua's law. CSH emailed Ms. Jackson on 22 August 2017 confirming receipt of her personal testimony
Josselin, Noelani	Cultural practitioner	Letter and figures sent via email 9 May 2017
Kallai, Hope	Cultural practitioner	Ms. Kallai called CSH and left a message on 23 May 2017 CSH returned Ms. Kallai's call on 23 May 2017. Ms. Kallai stated she is a *haumana* (student) of Kumu Nathan Kalama. She wanted to see if there was a public meeting with OHA, KIUC, and the Mokihana Foundation for an update on the long, ongoing CIA. Ms. Kallai proposed a public meeting discussing the background of the CIA work done previously done by Kehaulani Kekua and asked if CSH had a copy. Ms. Kallai discussed water issues, water diversions, and river flow. CSH invited Ms. Kallai to participate in the CIA and expressed that there would be no public meetings with OHA or KIUC due to time constraints, however, CSH offered to meet with a small *hui* (group) for an interview if Ms. Kallai organized it. Ms. Kallai emailed CSH on 23 May 2017 with several attachments (see Appendix B) CSH called Ms. Kallai on 22 June 2017 twice, no answer Ms. Kallai emailed CSH on 30 June 2017 with the previous cultural study conducted; CSH emailed Ms. Kallai thanking her for the study and letting her know that Ms. Nani Rogers referred me to her to set up a group consultation

Name	Affiliation	Comments
		Ms. Kallai emailed CSH on 2 July 2017 with an attachment of Mr. Daphaniel Woolsey’s testimony to the Commission on Water Resource Management (CWRM) CSH emailed Ms. Kallai on 3 July 2017 thanking her for the referral and followed up on a possible consultation with her CSH called Ms. Kallai on 3 July 2017; set up a tentative consultation date within the next two weeks CSH called Ms. Kallai on 11 July 2017; left a message CSH called on 12 July 2017; left a message CSH called on 18 July 2017; left a message CSH called Ms. Kallai on 19 July 2017 and discussed the amount of attendees for meeting she organized at Hā Coffee Shop on 20 July 2017; CSH also added that we would be unavailable for consultations on the morning of 21 July 2017 Letter and figures resent to Ms. Kallai on 24 July 2017; CSH thanked Ms. Kallai for organizing the community meeting originally at Hā Coffee Shop and *mauka*; CSH requested she make a list of those present at the County building community consultation Ms. Kallai responded to CSH via email on 26 July 2017 debriefing on 20 July 2017 meetings Ms. Kallai emailed CSH on 8 August 2017 with her testimony (see Section 6.6 for Ms. Kallai’s personal testimony) CSH emailed Ms. Kalli on 9 August 2017 confirming receipt of testimony Ms. Kallai emailed CSH on 29 August 2017 with a complaint filed by Adam Asquith; also gave contact info for Aunty Mabel Makanani
Kalama, Nathan	*Kumu hula*, Kawaihau Representative, KNIBC	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Kaluahine ‘Ohana	*Kama‘āina*	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017

Name	Affiliation	Comments
Kamai, Joe	*Kama‘āina*, Cultural Practitioner	Mr. Kamai attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Letter and figures sent via email on 27 July 2017 Follow-up email regarding sending intial letter with figures and submitting testimony on 7 August 2017
Ka‘ohelauli‘i, John	*Kama‘āina*, cultural practitioner	Mr. Kaohelauli‘i emailed CSH his personal testimony via email on 17 August 2017 (see Section 6.11 for Mr. Ka‘ohelauli‘i’s personal testimony) CSH confirmed receipt of receiving his testimony on 18 August 2017 via email
Kapuleokamehameha, Kamu	*Kama‘āina*, cultural practitioner, occupying the former Coco Palms Hotel	Mr. Kapuleokamehameha attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Letter and figures sent via email on 7 August 2017 Second letter and figures and follow up sent via email on 16 August 2017
Kaua‘i Historic Preservation Commission		Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Kaua‘i Historical Society		Letter and figures sent via USPS 9 May 2017
Kaua‘i Museum		Letter and figures sent via USPS 9 May 2017
Kaua‘i Phillipine Cultural Center		Referred by Ka‘ahiki Solis, SHPD Letter and figures sent via USPS 22 June 2017
Kauka, Sabra	Hawaiian cultural educator	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017 Ms. Kauka was contacted by CSH on 29 October 2018; interview set for 5 November 2018 Interview conducted with Ms. Kauka and Mr. Danny Hashimoto in Līhu‘e, Kaua‘i at Papaya’s on 5 November 2018 CSH emailed Ms. Kauka a draft of her interview summary on 3 December 2018 Ms. Kauka emailed edits on 4 December 2018; CSH completed edits the same day CSH was asked to contact Ms. Kauka for her to elaborate on the school garden at Island School; CSH emailed Ms. Kauka with the following:

Name	Affiliation	Comments
		We spoke to [our client] who had mentioned you have a community garden at Island School. Is that correct? I didn't hear you mention it during your interview recording, but [our client] talked to us a bit about it. Could you elaborate on the community garden a bit? What kind of plants are available? Where did you get the seeds or starters from? How is this garden irrigated? Ms. Kauka replied via email the same day with the following: *Our entire campus is landscaped with native plants.* *We also at times have had considerable Uala growing by my classroom. However, we cut back on the Uala when the wild pigs started digging them up.* *The garden next to my classroom has wauke, Uala, palapalae, Pikake, ma‘o, mamaki, Olena, Hala, la‘i, Koa, Kamani, ‘uki‘uki, kukui, ohi‘a lehua, ko‘ula, some Laua‘e...that garden depends on rainfall.* *Most of those plants came from NTBG. But the ko‘ula came from Marquis Hanalei Marzan. The la'i came from ancient plantings in Nu'alolo Kai traced genetically by DNA to Raiatea (I think) Google the report online. It was a woman's dissertation.* *Then there's another garden with lots more edible plants. I don't get there often but can check it out next week.* CSH replied to Ms. Kauka via email on 19 April 2019 thanking her for her feedback Ms. Kauka added the following statement via email on 19 April 2019: *Kale, tomatoes, cucumbers, green beans, eggplant, taro - from what I remember. But I'll take a closer look and a photo or two next week.* See Section 7.2 for Ms. Kauka's joint interview with Mr. Danny Hashimoto

Name	Affiliation	Comments
Kekaualua, Punohu	*Kama‘āina*, cultural practitioner	Mr. Kekaualua attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Letter and figures sent via email on 24 July 2017 Follow up email regarding sending intial letter with figures and submitting testimony on 7 August 2017
Kelekoma ‘Ohana	*Kama‘āina*	Letter and figures sent via email 9 May 2017; letter and figures returned the same day
Kililau, Lilian	*Kama‘āina*	Letter and figures sent via email 9 May 2017; letter and figures returned the same day
Leibbrandt, Michael	*Kama‘āina*	Mr. Michael Leibbrandt sent CSH his personal testimony via email on 17 August 2017: *I am a direct descendent of Ohana Hanapi and Wailuamanuokalanipo. My family for generations has used the water from that north fork for gathering and fishing that flows down stream out to the ocean.* *We have lost the opae’ and other animals because the water has been diverted and it brings so much life for hunting and fishing. Right now its dry and only flowing because KUIC opened a corner before the surveyor came up to investigate . . . The fork doesn’t need to be diverted 100% . . . why 100%? Bring back our water . . . Water Is Life in so many ways . . .* CSH confirmed receiving Mr. Leibbrandt’s personal testimony via email on 18 August 2017
Lovell, Carol	*Kama‘āina*, former Director of Kaua‘i Museum	Referred to CSH by OHA Letter and figures sent via email on 31 August 2017
Makanani, Mabel	*Kupuna*	Referred by Hope Kallai; due to time constraints, CSH was unable to contact
Mālama Kaua‘i		Referred by Ka‘ahiki Solis, SHPD CSH called on 21 June 2017 for a general email address; no answer Letter and figures sent via USPS 22 June 2017
Matsushima, Lester	*Kama‘āina* and fisherman	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017

Name	Affiliation	Comments
Mau-Espirito, Noa	*Kama‘āina*, cultural practitioner, occupying the former Coco Palms Hotel	Mr. Mau-Espirito attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a Letter and figures sent via email on 27 July 2017 Follow-up email regarding sending intial letter with figures and submitting testimony on 7 August 2017 Mr. Mau-Espirito emailed his testimony to CSH on 15 August 2017. Mr. Mau-Espirto’s testimony can be found in Section 6.7
Mayer, Kanoa	Resident of Olohena	Mr. Mayer emailed CSH his testimony on 4 July 2017; see Section 6.9 for Mr. Mayer’s personal testimony
Moriguchi, Laraine	Director, Kapaia Foundation	Letter and figures sent via USPS 9 May 2017 Ms. Moriguchi replied via email on 9 May 2017 with the following: *Thanks for informing us about the water diversion request and for giving us the opportunity to comment. I'm going to forward this email to members of Kapaia Foundation who are very knowledgeable and interested in this matter.* CSH replied to Ms. Moriguchi on 15 May 2017 thanking her for passing on the information to members of the Kapaia Foundation Ms. Moriguchi replied via email on 16 May 2017 stating she forwarded the consultation letter and figures to David and Nina Monasevitch
Muraoka, Beverly	*Kumu hula*, cultural practitioner, and former entertainer at Coco Palms Hotel	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017 CSH received a letter from Ms. Muraoka via USPS on 12 September 2017; see Section 6.13 for Ms. Muraoka’s personal testimony; see Appendix A for Ms. Muraoka’s letter to CSH
Muzik, Katherine	Teacher, Researcher (coral and *limu* [general name for seaweed])	Ms. Muzik attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 Letter and figures sent via email on 27 July 2017 Ms. Muzik responded via email on 27 July 2017 with the following: *I am looking forward to meeting with you again with my water “team” from Kapaa High School!*

Name	Affiliation	Comments
		We are interviewing kupuna (past) and DOH (present), planning our future. CSH responded to Ms. Muzik's email on 28 July 2017: *I'm not sure if I'll have time to fly to Kaua‘i again for interviews so I'm encouraging everyone that I met with last week to send in written testimony/statements instead. If you're still interested, please send your concerns in writing. Maybe you can get your "water team" together and put write a statement based on your findings with kupuna, DOH, and your research and submit to me? It can be anywhere from a paragraph to several pages long—whatever you choose. Mahalo for doing great work in the Kaua‘i community!* CSH sent a follow up email regarding sending intial letter with figures and submitting testimony on 7 August 2017 Ms. Muzik responded the same day with the following: *I am deeply pleased to receive your email invitation to attend your Blue Hole Diversion project. Thank you!* *However, my team (Instagram at "Alohawaiwai") is concentrating for now on our local Kapa‘a, Anahola and Aliomanu watersheds . . . three senior ladies, one freshwoman. Certainly as we grow, our group will include Wailua watershed students too, so I'm sure you will be hearing from us!* *Mahalo for the respect you showed "my" young women!!* *Do not hesitate to contact me if I might help in any way. Of course I am not limited to Kaua'i watersheds, my concerns are global.* CSH emailed Ms. Muzik on 8 August 2017 thanking her for sharing her *‘ike* and *mana‘o* on the east Kaua‘i shorelines and how coral and *limu* are in danger. Ms. Muzik responded to CSH via email the same day with the following: *Fantastic! My Kapa‘a site is described on my website, www.ourwaterdrop.org. I call it Mala Moana, "ocean garden". It is a great place to*

Name	Affiliation	Comments
		study, because curious people passing by on the Bike Path have time to stop, to talk, to learn about my efforts there! *I look forward to working with you in the future. I figure I have about 30 more years, we have time!*
Palmeira, Waldeen	Long-time resident of Wailua	Letter and figures sent via USPS 9 May 2017 Letter and figures returned 14 May 2017
Rogers, Punani	Member, Ho‘okipa Network Resident of Kapa‘a Kaua‘i Coordinator, ‘Aha Moku Council	Letter and figures sent via email 9 May 2017 Ms. Rogers replied to CSH via email on 15 May 2017 with the following: *We have been waiting for years for a CIA from Kehaulani Kekua! Was she notified of this? Is there an explanation to why there was so many delays re: Cultural Assessment?* CSH responded via email on 16 May 2017 with the following statement: *Aloha, I forwarded your questions to KIUC and they have issued the following statement:* *Kauai Island Utility Cooperative (KIUC) has recently engaged Cultural Surveys Hawaii (CSH) to complete a Cultural Impact Assessment (CIA) as required under the November 2006 Memorandum of Agreement (MOA) between KIUC and the Office of Hawaiian Affairs (OHA). KIUC has worked for approximately ten years with a Kauai-based consultant to complete the CIA, to no avail. In late 2016 the Kauai-based consultant became unresponsive, and KIUC was forced to search for a new consultant to complete the CIA. KIUC remains committed to completing a CIA according to Hawaii State guidelines under the terms of its MOA with OHA.* Ms. Rogers replied via email to CSH on 22 May 2017: *Participants on Kauai that have been going to meetings and monitoring the water at Blue Hole are requesting a public forum for discussion and to find our why it took so long for a CIA. Why weren't we notified sooner? I think you can learn a lot from our people about the cultural significance of our water from Waialeale.*

Name	Affiliation	Comments
		Please let me know asap if this is a possibility. We want to assist you in any way we can, so come see us and let's gather for a kukakuka. *Mahalo a nui,* *Nani Rogers* CSH responded to Ms. Rogers via email on 22 May 2017: *I’ve been getting quite a bit of feedback from the public requesting a public meeting. I have relayed these concerns and suggestions to our client, but due to the short timeline to submit a draft deliverable, we won't be able to put together any public meetings. However, I am very open to meeting with you and/or your hui to talk story about the project and any concerns and impacts that you may have. I will be going on vacation from May 31st to June 8th, so any time after mid-June to mid-July I'm available. Not sure if you want to discuss amongst your hui or just throw me a few dates that will work for you and we can figure out a date for me to fly over (I live on the Big Island). Feel free to call me at the Hilo office as well (808) 965-6478.* CSH called Ms. Rogers on 21 June 2017 and left a message Ms. Rogers returned CSH’s call on 22 June 2017; mentioned that Ms. Kallai would organize meeting/interview with CSH Ms. Rogers attended the community meeting at the Kaua‘i County rotunda on 20 July 2017 Ms. Rogers contacted the CSH Hilo office on 21 July 2017; CSH contacted Ms. Rogers who thanked us for coming to Kaua‘i to hear the community’s *mana‘o* Ms. Rogers called CSH on 28 August 2017 to comment on another project, but briefly discussed the current project. She suggests diverting water from Waiahi Stream to power the hydros and that the permit should be renewed for a lesser amount of years than the proposed 65-year lease renewal
Rosa, Joe	*Kama‘āina*, knowledgeable in plantation era	Letter and figures sent via USPS 9 May 2017

Name	Affiliation	Comments
Smith, Kamika	*Kama‘āina*	Referred to CSH by OHA Letter and figures sent via email on 31 August 2017
Solis, Ka‘ahiki	Cultural Historian, SHPD	Letter and figures sent via email 15 June 2017 Ms. Solis replied with the following response via email on 16 June 2017: *Heres a list of a few more orgs. I do not know if you have these already.* *http://www.malamakauai.org/mk/* *https://sierraclubkauai.org/* *https://kauai.surfrider.org/* *http://www.waipafoundation.org/* *http://kauaiphilippineculturalcenter.org/* *HOOKIPA NETWORK OF HAWAIIAN CBO'S ON KAUAI* *P.O. Box 88* *Kapaa, HI 96746* *(East Side)* *Tel. (808) 821-CBOS* *KAUAI HERITAGE CENTER OF HAWAIIAN CULTURE & THE ARTS* *Kauai Village* *4-831 Kuhio Highway, Suite 308* *Kapaa, HI 96746* *(East Side)* *Tel. (808) 821-2070*
Sonognini, Ryan	Cultural practitioner, *‘ohana* lands in Makaweli Ahupua‘a	Mr. Sonognini attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017 Letter and figures sent via email 8 August 2017 Follow up text sent to Mr. Sonognini on 18 August 2017
Surfrider Kaua‘i		Referred by Ka‘ahiki Solis, SHPD Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Tong, Natshja	OHA	Ms. Tong sent an email to client who forwarded referral list to CSH; list included the following contacts: Carol Lovell, Milton Ching, Kamika Smith, Mauna Kea Trask, and Adam Asquith
Trask, Mauna Kea	County Attorney, County of Kaua‘i	Referred to CSH by OHA

Name	Affiliation	Comments
		Letter and figures sent via email 31 August 2017; Mr. Trask responded the same day via email stating he would review and get back to CSH as soon as possible CSH followed up with Mr. Trask on 5 September 2017
Trembath, Healani	Cultural practitioner	Letter and figures sent via USPS 9 May 2017 Second letter and figures sent via USPS 22 June 2017
Vaughan, Mehana Blaich	*Kama‘āina* and Associate Professor in the Department of Natural Resources and Environmental Management at the University of Hawai‘i at Mānoa	Ms. Vaughan sent testimony via email on 11 September 2017; CSH replied to Ms. Vaughan thanking her for her *mana‘o*; Ms. Vaughan replied to CSH the same day adding that she is also a community member who was raised in Kilauea, Kaua‘i; see Section 6.12 for Ms. Vaughan’s personal testimony, also available in Appendix C
Waipā Foundation		Referred by Ka‘ahiki Solis, SHPD Letter and figures sent via USPS 22 June 2017
Woolsey, Daphaniel	*Kama‘āina* and cultural practitioner	Referred by Hope Kallai, cultural practitioner Ms. Hope Kallai sent an email with Mr. Daphaniel Woolsey’s testimony to the Commission on Water Resource Management (CWRM) on 2 July 2017 CSH called Mr. Woolsey on 3 July 2017 letting him know that he was referred by Ms. Hope Kallai and if he’d be interested in participating in the study; CSH explained what a CIA entails and the process; Mr. Woolsey said he’s interested in participating; he added that the diversion is lowering levels of water in the streams Letter and figures sent via USPS 3 July 2017 Mr. Woolsey called CSH on 10 July 2017 and left a message confirming he received the letter Mr. Woolsey attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017
Young, Koa	*Kama‘āina*	Contacted CSH via email on 17 August 2017 requesting what information is needed for written testimony

Name	Affiliation	Comments
		Letter and figures sent to Mr. Young via email on 17 August 2017 Mr. Young submitted testimony via email on 18 August: *I was told by the old timers (I think the term is Kupaaina?) the water from there is special because of its purity, and as a youth my father and I would fish the stream together going all the way up* *I don’t think that any of that whole area should be touched since theres less intrusive ways to get electricity, and because of its pristine water and land. They need to have better solutions than to go into the interior of the island for cheap power* CSH confirmed receipt of Mr. Young’s testimony via email on 18 August 2017

6.4 Group Community Consultation and *Huaka‘i* (Voyage) to Hanamā‘ulu and Wailua Mauka

On 20 July 2017, CSH traveled to Kaua‘i to meet with the community and discuss cultural impacts and concerns regarding the proposed KIUC Blue Hole Diversion Long Term Lease project. The community meeting was organized by Hope Kallai, a long-time resident of Kaua‘i and *haumana* (student) of Kumu Hula Nathan Kalama, at Hā Coffee Shop located in Līhu‘e. Due to a large community turnout, the meeting was moved to the Kaua‘i County rotunda farther down the road.

The meeting began with 11 community members including Ted Blake, Puanani Rogers, and Nicole Hoku Cody. A few community members joined the group throughout the meeting including Debbie Jackson of Huleia Farms and Katherine Muzik, coral and *limu* researcher. CSH was represented by Dr. Hallett Hammatt, President and Principal; Nicole Ishihara, CIA Project Director and Cultural Researcher, who facilitated the discussion; and Aulii Mitchell, Cultural Advisor to Dr. Hammatt and the staff of CSH.

Dr. Hammatt opened the meeting welcoming all attendees followed by a *pule* (prayer) led by Aunty Puanani Rogers. The community then introduced themselves and expressed questions and concerns regarding the proposed project. The following bullet points exhibit what was discussed during the community meeting:

- Aunty Nani Rogers asked how many years the water lease was valid for. When she was referred to the community consultation letter, which stated 65-years, she called the terms “ridiculous.” Aunty Nani recommends that the water not be 100% diverted.
    - Aunty Nani stated that she is very culturally connected to the water (emanating from Wai‘ale‘ale) and it is used for ceremonial purposes.
    - Aunty Nani added that you cannot separate water from the land—they go together. She said, “Without water you cannot live or perpetuate the culture.”
- Kamealoha Hanohano-Smith gave testimony (see Section 6.5).
- Sharon of Hui Ho‘opulapula Na Wai o Puna visited the Blue Hole Diversion with friends on 25 February 2017. She described the stream as being 100% diverted going in the direction of Hanamā‘ulu Ahupua‘a. She added that no water was going into Wailuanuiahoano past Poliahu Heiau, Hikinakala Heiau, and to the ocean. She noted that “fresh water does so much for the ocean and everything that is in it.” She felt stunned and enraged. She feels that culture is only going to be decimated further if a long-term permit is issued. She continued to describe her *huaka‘i* with her friends, adding that before they left the area, they envisioned what it had been like without the diversion and danced to “Maika‘i Kaua‘i” to honor the beauty and spirit of what the water would be like if it flowed 100%. She added that accountability, water reporting, and sharing of information about the water should be disseminated to the public. Sharon stated, “*Ola I ka wai*—Water is life.” She relayed what she observed at the diversion to her *hula* sisters and *kumu* then reached out to as many *kumu* as she could. She referred all *kumu* to CSH and urged them to call and share their *mana‘o* about Wai‘ale‘ale and how much it means to them. She closed her *mana‘o* with the following statement,

"When *Kānaka Maoli* think about Hawai‘i two important images come to them: Mauna Kea and Wai‘ale‘ale. I think both are worth defending."

- Ted Blake asked, "Is this above the diversion or below the diversion?"
- Sharon responded, "At the diversion."
- Hope Kallai stated that the diversion was not destroyed, however, only 20% of the water is restored to the North Fork. A small chip was in the dam's face. The other 80% of the water goes into the ditch. She added that KIUC goes out every Monday and "undo what has been done over the weekend" and diverts 100% of the water that is supposed to go into the North Fork to the South Fork.
- Mr. Blake asked, "How does that affect the South Fork? The South Fork doesn't get water unless it's from that diversion. The farm areas in Hanamā‘ulu don't get water unless it's from the diversion."
- Ms. Kallai replied, "The South Fork is ‘Ili‘ili‘ula."
- Mr. Blake continued, "The water comes from the North Fork that fills the Hanamā‘ulu Ditch through the South Fork."
- Ms. Kallai responded to Mr. Blake, "There's two ditch systems which reaches six different rivers, not just the North Fork. North Fork, Waikoko, ‘Ili‘ili‘ula, Waiaka, and Waiahi all form the South Fork not just the North Fork waters." She added that she has KIUC workers who come up every Monday on film after the ditch was damaged and the workers did not notice the difference in the flow of the water.
- Mr. Blake stated, "We have a difference in opinion."
- Ms. Kallai: "We went up there yesterday, it's not messed up. It was cut in a couple of places when they gauged the difference. It was less than 20%."
- Sharon stated that after she went to the diversion on 25 February 2017, she went to the Planning Commission the following Tuesday and testified to the commissioners and in regards to the General Plan. She said, "This can't be happening. It's not right." She keeps thinking about the millions of creatures that live in the water that will be decimated because there's no water there.
- Ms. Kallai added the following:
    - The dam was already damaged in October 2016. Some people tried to "right a wrong" and at that time 20% of the water was still allowed to go into the North Fork. The area that allowed the 20% flow is now filled in with rocks and sediment done by heavy equipment.
    - Reiterated that every Monday a contractor travels to the diversion to undo what the community does every weekend. From the point of the diversion, the North Fork is bone dry for about a mile and a half unless it is raining hard. If it is raining hard, the stream will gain water. However, there is no hydrological continuity of the North Fork from the ocean to the source. There is a dry mile or two due to the diversion. Springs and other streams put water back into the North Fork, which gives the illusion that it's gaining water until it drains into the ocean.
- Katherine Muzik, who works on watershed issues with two Kapa‘a High School students, has observed lots of dying coral and *limu*.
- Ms. Kallai discussed her *hula mana‘o*:

- Her *hula* lineage started 60 years ago with Lani Kalama, Puna Dawson, and Uncle Nathan Kalama. She currently dances with Maka Harrod. Approximately eight to ten years ago, she danced to one of Uncle Nathan Kalama's songs. She retells the story of how Uncle Nathan Kalama wrote the *mele*. After Hurricane ‘Iniki, Uncle Nathan was sitting at Lydgate Park and was in the process of writing the *mele*. He was listening to the sticks and trees that were coming down the river. As he was listening, he could tell what types of trees were getting washed down the river and emptied into the ocean. It's a *kāla‘au* (stick dancing) dance about the sound of the sticks. After *hō‘ike* (show, exhibit), Ms. Kallai travels *mauka* to offer her *lei*. She places her *lei* in the water and because of the diversion, it goes to Hanamā‘ulu instead of Wailua where the *mele* was written. She adds that although it's a *manini* (stingy) cultural practice, it's the epitome of the problem—the water is shipped out of the *ahupua‘a* and there is no hydrological continuity. *‘O‘opu* cannot get up the river. She pointed out that the biological study is being done by someone from the East Coast and doesn't know about fish that climb. She finishes by stating that "to divert the water for 65 years without thinking about the impact to the living and children is wrong."

- Mr. Hanohano-Smith added that "a lot of people are not present at the meeting today, but there are a lot of cultural practitioners out there right now who are practicing subsistence." Mr. Hanohano-Smith suggested a compromise with KIUC and believes that the public should not compete for water.

After the meeting in Līhu‘e, CSH was invited by Mrs. Kallai to see the diversion and meet other concerned members of the community, *kama‘āina*, *kūpuna*, and cultural practitioners. Community members included Joseph Kamai, Kyle Gilmore, Felicia Cowden, Noa Mau-Espirito, Thompson Aipa-Rivera, Jim Woolsey, Kamu Kapuleokamehameha (Charles Hepa), and the Kallai's (Tim and Hope). We met in the parking lot at the Kuilau Ridge Trailhead and carpooled to the upper reaches of Wailua Ahupua‘a, which can only be accessed by 4x4. On the jeep trail, a large *pōhaku* was observed by CSH. Mr. Mau-Espirito and Mr. Kapuleokamehameha both stated that this *pōhaku* was a *kia‘i* (guard, watchman; Figure 31). The community members showed CSH the Ili‘ili‘ula North Wailua Ditch and Waikoko Diversion (Figure 32 through Figure 34) followed by traveling on the jeep road to the North Fork. On the right side of the jeep road was another large *pōhaku kia‘i* (Figure 35). At the North Fork other community members were present including Dustin Barca, Punohu Keakaualua, Ryan Sonognini, Daniel Anthony, and Ka‘imi Hermosura. Arrival at the North Fork included *pule* and an introduction of community members present as well as CSH introducing the study. CSH passed on contact information to community members present and later followed up with emails and phone calls to those who provided information to CSH (see Table 1). Figure 36 depicts the North Fork and the diversion toward the Waikoko Diversion. Figure 37 is a photo of water emanating from Wai‘ale‘ale before the North Fork and Waikoko Diversions. Figure 38 is a USGS map labeled with pre- and post-Contact sites, tributaries, wildlife habitats, areas utilized for gathering, and Hawaiian terminology in terms of elevation, pointed out by community members at the group consultation meeting.

Figure 31. Photo of *kia‘i* on jeep trail to the North and South Forks of Wailua River (CSH 2017)

Figure 32. Photo of ditch between North Fork Wailua and Waikoko (CSH 2017)

Figure 33. Photo of *‘ōpae* caught with a scoop net (CSH 2017)

Figure 34. Photo of community members at the Waikoko Stream and diversion (CSH 2017)

Figure 35. Photo of *pōhaku kia‘i* on the right side toward the North Fork (CSH 2017)

Figure 36. Photo of North Fork (right) and the diversion to the ditch between North Fork Wailua and Waikoko (left) (CSH 2017)

Figure 37. Photo of water emanating from Wai‘ale‘ale; looking toward Blue Hole (CSH 2017)

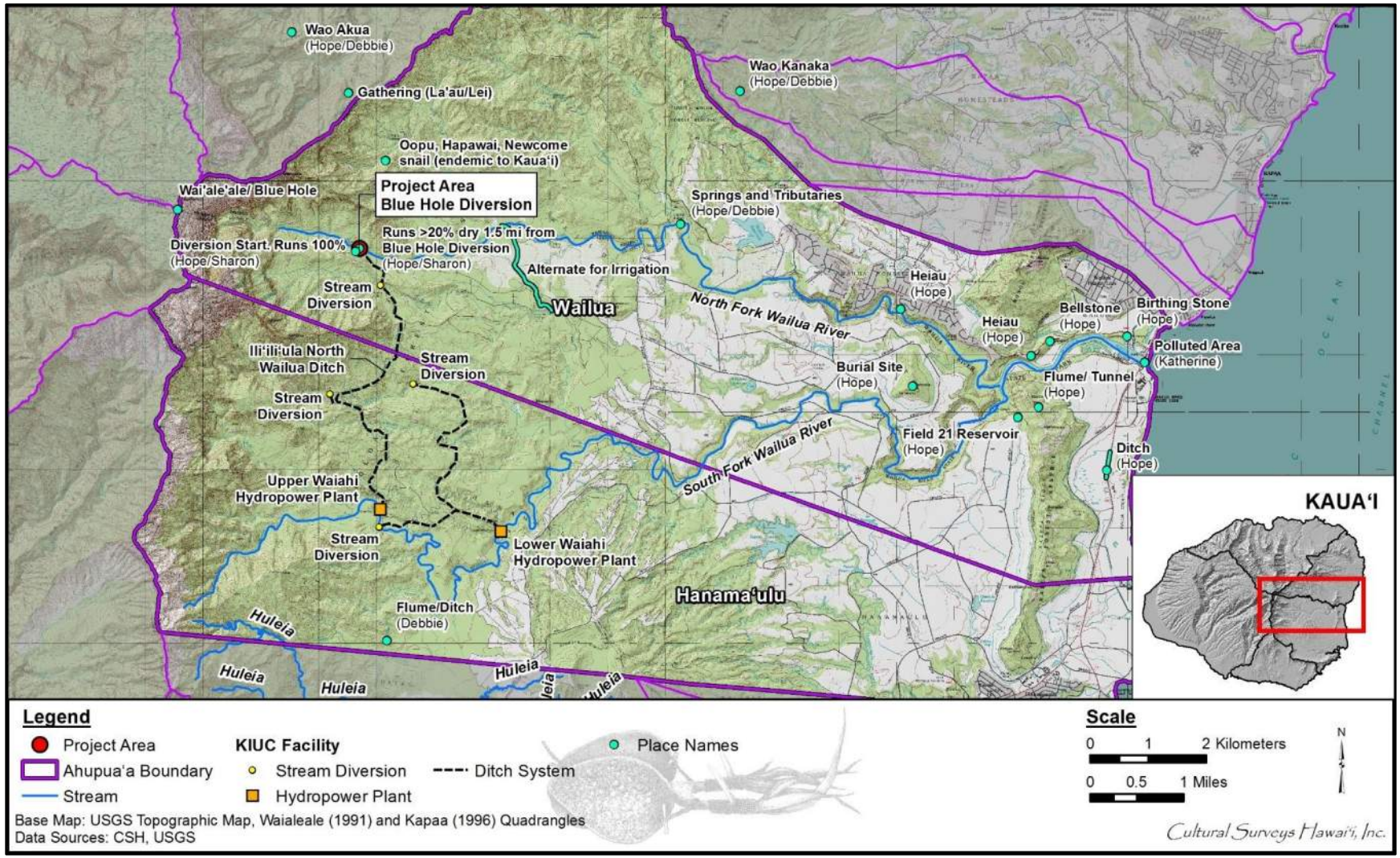

Figure 38. 1991 Waialeale and 1996 Kapaa USGS topographic quadrangles with points of interest (pre- and post-Contact sites; tributaries; wildlife habitats; areas utilized for gathering; and Hawaiian terminology in terms of elevation pointed out by the community at the group consultation meeting on 20 July 2017)

6.5 Response from Kamealoha Hanohano-Smith

Mr. Kamealoha Hanohano-Smith and CSH have exchanged dialogue spanning from 15 May 2017 through 24 July 2017 via email and phone (see Table 1 for expanded responses). Mr. Hanohano-Smith attended the community consultation meeting at the Kaua‘i County rotunda on 20 July 2017 where he presented oral testimony regarding the proposed 65-year lease renewal for the KIUC Blue Hole Diversion:

> Aloha,
>
> My name is Patrick Soloman Kamealoha Hanohano-Smith and I am a practitioner, who practices kilo, kalo, and hoomana in Puna Moku. My practice includes doing protocol and engaging in both spiritual and cultural practices. All the spiritual and cultural practices I engage in require water from the Wailua River and other streams in this and other moku around the island. Without wai, as articulated in many Hawaiian chants such as Ka Wai A Kane, Kunihi and mele such as Ku‘u Aina Puna, I and other practitioners, farmers, and those engaged in aquaculture would not be able to continue our practice.
>
> 50 or 60 years ago, Hawaiian Immersion and Hawaiian-focused charter schools did not exist; outreach programs in our area, like Kaiaulu Papaloa, did not exist. There are halau, and community supported initiatives like Charles Hepa folks, Native farmers, who are all engaged in agricultural practices. These kula, papahana, a halau all focus on teaching traditional ecological knowledge, methodologies, language, culture, and native science: all skills needed to be traditional practitioners for spiritual and cultural practices, and also support practitioners who want to work in agriculture, aquaculture, renewable energy, sustainability, all industries that support our island economy. What will their future job prospects look like in the future, if they are being trained to work in Puna Moku and there is no water? How responsible are we being as an island community, if we are training people in industries in which there is no land or ocean areas suitable for cultural/spiritual practices, and suitable for practitioners who work in agriculture, aquaculture, etc.
>
> We are in the process of restoration, re-establish, revitalize, and updating all of our practices so that they relevant and meaningful in today world, today’s economy, today’s society, and this takes time, money, understanding, and grace. And we are doing all of this work for very little money, resources, support, and understanding.
>
> I read Kumu Kehau’s study and what she wrote was crystal clear - the kaona of her report, the na mea huna noeau, the underlying meaning of her report was well received. And in the end, I believe she did the right thing by implying, aole i pau . . . the ha‘ina to the story did not end with her report. It was just the beginning; so mahalo to her for recognizing the need for more research and time to complete the CIS, to not have a fixed deadline and for not forcing us to agree to terms that are unacceptable. She did all of us practitioners a huge favor by saying ‘a‘ole i pau, our story is not done being told.
>
> The dialogue has to continue with no fixed deadline to complete the Cultural Impact Statement. The CIS should be done, when its [*sic*] done and the deadline should

not be dictated by KIUC and others who don’t understand the impact to Kanaka Maoli, kanaka hana noeau, today and in the future. Rushing this process will only lead to devastating consequences not just for Na Mea Hawaii, things Hawaiian, but will have residual negative impact on all aspects of our island life, including but limited to education, the visitor industry, agriculture, aquaculture, and those engaged in resource management, environmental sciences, and those who are concerned about the integrity of our mokupuni.

Noi ha‘aha‘a au ia oukou pakahi, I humbly ask Cultural Surveys Hawaii and others involved in this process for patience and grace to work with Kanaka Hana Noeau, Native Hawaiian Practitioners so we can put together a plan that is pono; and allows for our Na Mea Hawaii to prosper and proliferate, mai keia mua aku, from this day forward.

Also, that will work to raise the collective self-esteem of the community and work to help build opportunities for people to climb out of poverty. I urge everyone to support a process that supports dialogue with aloha, lokahi, hoomanawanui, waiwai (for everyone), and ike kupuna, the opportunity to do right by your kupuna. They, our kupuna, for those kupuna living and for those who made the transition, support us and continue to guide us in our efforts to be pono for our beloved kanaka and aina.

Me ke aloha pau‘ole, I humbly ask that you consider and look favorably on my manao.

Kamealoha

6.6 Response from Hope Kallai

Ms. Hope Kallai initially contacted CSH via phone on 23 May 2017 and continued to exchange dialogue via email, phone, and in person until 9 August 2017 (see Table 1 for expanded responses). She also attended the community consultation meeting at the Kaua‘i County rotunda and the *mauka huaka‘i* on 20 July 2017. Figure 39 through Figure 44 are Ms. Kallai’s written testimony submitted to CSH via email on 9 August 2017.

Re: WAILUA 35

Aloha e Nicole:

Please consider my concerns about the 65-year lease of water rights of the North Fork Wailua River to the Kauai Island Utility Cooperative for hydropower production.

The North Fork of Wailua river flows from a sacred mauna, Wai`ale`ale and the Alakai. The waters of Wai`ale`ale are sacred. The waters of Wai`ale`ale are included in many oli, mo`olelo, hula, pule, practices and pictures. The presence of the mauna as well as place of the KIUC diverson dam is sacred and spiritual. It is Wao Akua.

Continual water flow mauka to makai, is a cultural necessity as well as an essential migration corridor for native freshwater species. It is an inherent Kanaka Maoli kuleana to manage water in a pono way, and preserve o`opu and hihiwai migration

Water resources were explained as belonging to the chiefs and the people, not the King, in the 1839 Declaration of Rights and the 1840 Constitution. The 1839 Law Respecting Water for IrrigationWater rights were tied to the land. Section 7 of the Enactment of Further Principles, Laws of 1850, Kuleana Act provided that:

> The people also shall have the right to drinking water, and running water and the right of way.

In the1850 Kuleana Act creating the Mahele, ownership of water in natural watercourses, streams and rivers remained with the people of Hawaii, for their common good. Article XI, section 7 of the 1978 Hawaii State Constitution reiterates the public trust doctrine and directs the state to “protect, control and regulate the use of Hawaii’`s water resources for

Figure 39. Page 1 of Ms. Hope Kallai’s personal statement regarding the KIUC Blue Hole Long Term Lease project

the benefit of its people," and created the Commission on Water Resources Management. HRS 174C, enacted in 1987 recognizes specific rights: Native Hawaiian, appurtenant, riparian and correlative and directs appropriate management of ground and surface water for public trust purposes.

The 1973 *MyBryde v Robinson* decision about water rights on the Hanapepe River clarified "natural flow," and reaffirmed that Hawaii's water resources are a public trust which should be managed for the benefit of present and future generations for their common good.

In the *Waihole* Decision the Court found "We have rejected the idea of public streams serving as convenient reservoirs for offstream private use (p. 155, Waiahole Decision) and "Under no circumstances…do the constitution or (Water) Code allow the (Water) Commission to grant permit applications with minimal scrutiny." This project has had minimal scrutiny for 17 years, yet has de-watered the 100% of baseflow of the North Fork Wailua.

I have watched many people see the mauka waters of the North Fork Wailua for the first time: families with children and kupuna, hula and cultural practitioners, hunters, visitors - Kanaka Maoli, Europeans, Japanese. Everybody is visibly moved. The sacred beauty of the waterfalls from Wai`ale`ale visible from the area of the KIUC diversion are epic, awe-inspiring and a unique and significant cultural landscape.

Then, you see a massive amount of concrete poured in the middle of a stream, blocking all natural baseflow and capturing all water in a ditch. Many people cry when they see

Figure 40. Page 2 of Ms. Hope Kallai's personal statement regarding the KIUC Blue Hole Long Term Lease project

this concrete stopping the waters from Wai`ale`ale from reaching makai Wailua. Some are so shaken, they have to leave. Most do not understand how this can be allowed to continue to their sacred waters and cannot forget the achey feeling of this bone-dry stream.

I know traditional hunters and gatherers who cannot use the mile or do downstream of the dam for hunting, because there is no water to support their hunting kalo patches. They are forced to plant mauka of the dam and diversion, where the stream flow is not diverted into a ditch.

This river is so significant to Native Hawaiians that some have tried to restore the flow in the North Fork Wailua, at least that's what the ditch maintenance guys allege. In October, 2016 unknown persons attempted to restore the flow of the North Fork Wailua to the dry stream bed by using rock saws.

Figure 41. Page 3 of Ms. Hope Kallai's personal statement regarding the KIUC Blue Hole Long Term Lease project

The KIUC has posted rewards for these actions, calling it eco-terrorism, with a possible jail sentence of 25 years. The restoration of flow of the North Fork Wailua is important enough for alleged Native Hawaiians to risk half-a-lifetime in jail. I do not know the source of their significant allegations to target this minority, with life-altering implications.

The dam has altered the depth of the bathing pool, making not enough water to soak in, because it causes sediment and cobble to build up mauka of the obstruction. The KIUC often uses heavy equipment in this pool, to the detriment of protected aquatic species.

Every week their company has to undo what they allege is done by Native Hawaiians, exercising their traditional practice of hiu wai.

The KIUC is a utility co-op, supposedly representing all users - including Native Hawaiians, yet this 65 year project is culturally offensive to many of their members. KIUC has never bothered to ask any local people about the impacts of their project, and adamantly deny impacts. Native Hawaiians feel further disenfranchised by this large island-wide utility co-op, the only power source available on Kauai.

The diversion of the North Fork Wailua River has had significant impact to the development of the Department of Hawaiian Home Lands 2009 Wailua Regional Plan, with 640 residences, schools, commercial developments, as the DHHL was told that there was not enough water for their 0.700 mgd potable water need, extending the wait another decade for the 1,621 Native Hawaiians on the residential Kauai DHHL Wait List. The socio-economic impacts of yet another sixteen hundred Hawaiians being kept landless/ houseless is huge, with generations not being able to afford to live on their own island,

Figure 42. Page 4 of Ms. Hope Kallai’s personal statement regarding the KIUC Blue Hole Long Term Lease project

and moving, severing families and generational traditional practices. This is cultural genocide.

This 65 year permit to drain the forest of water for KIUC's commercial needs is not pono water use. It is a cultural insult that should not be continued.

The KIUC has paid large fines for Endangered Species Violations. This project impacts protected species and could incur further fines. The potential fines would be carried by the rate payers of every culture and income group. KIUC has not considered the impacts of increased fines and legal fees from this project.

The existing dam and ditch structure is not safe. It is full of holes with exposed rebar. A dry dam encourages recreational use, not traditionally appropriate. Many hikers cross it dry hiking mauka and return to flood flow covering the dam. Getting a foot caught in one of the holes in the dam could be disastrous; the dam is a threat to public safety.

Figure 43. Page 5 of Ms. Hope Kallai's personal statement regarding the KIUC Blue Hole Long Term Lease project

Hawaii's water resources are a public trust, to be managed for the benefit of present and future generations for their common good. Commoditizing water resources for generations is not for the common good of the public. It is not for the common good of Native Hawaiians to feel powerless and disenfranchised. Sacred streams from the forest reserve should not be used as gutters to deliver water for off-stream use. Water flow should not be interrupted for 65 years by a utility company not concerned about impacting the local culture, traditions, beliefs, practices, gathering and hunting.

Mahalo for considering my concerns and caring enough to come to Kauai to understand and appreciate how important the flow of these waters are.

Hope Kallai

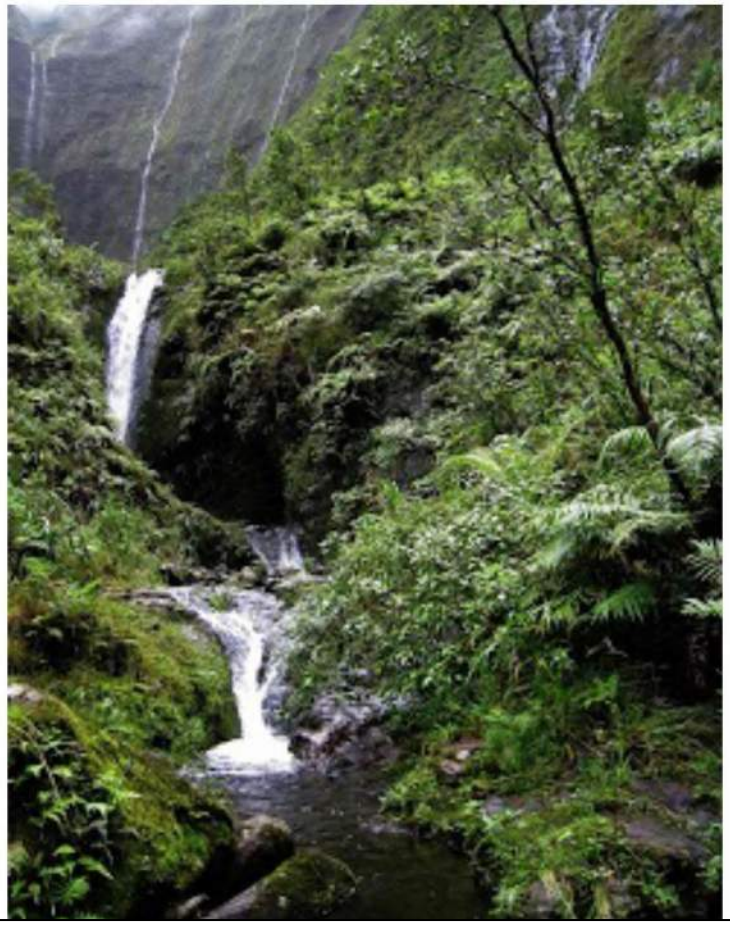

Figure 44. Page 6 of Ms. Hope Kallai's personal statement regarding the KIUC Blue Hole Long Term Lease project

6.7 Response from Noa Mau-Espirito

CSH met Mr. Noa Mau-Espirito on 20 July 2017 at the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a. CSH sent a community consultation letter and figures of the project area to Mr. Mau-Espirito on 27 July 2017. CSH sent a follow-up email to Mr. Mau-Espirito on 7 August 2017. On 15 August 2017, CSH received written testimony from Mr. Mau-Espirito, provided below:

> Aloha cultural surveys Hawaii
>
> I am a kanaka Maoli born and raised on Kauai living in Wailua ahupuaa on ancestral family lands known as Royal Patent 6020 LCA 3561 to J.Kaumualii
>
> My name is Noa K. Mau - Espirito I am a heir/lineal descendant of king Kaumualii and a wailua ahupuaa tenant
>
> I am currently in the process of protecting restoring and preserving the auwai o kawaiiki (waterway), lo‘i o kahoolealii (taro patch), and loko i‘a o kaluapulu (fish pond) on the property keep in mind that the taro patch fish pond and waterway is already recorded and surveyed by the land commission in the survey notes of the foreign/native testimony
>
> The Blue Hole water diversion would have a huge impact culturally on the restoration and preservation of my family’s taro patch waterway and fish pond
>
> To culturally Impact these sites on my family ancestral lands are so severe it is genocidal because of the affect it would have on our food for survival
>
> It is me my family and peoples traditional and customary vested birth right to farm kalo, raise fish, maintain the auwai (waterways) for subsistence and survival
>
> The water diversion at Blue Hole can not and must not happen for it will greatly culturally impact the fishing rights of the hawaiian people in the wailua ahupuaa river which is the biggest river In Hawaii with a lot of fish in it that my family depend on for subsistence the spawning of the o‘opu population would greatly affected as well
>
> O‘opu must not be affected for it is one of the main fish we eat as people of these islands.

Figure 45 and Figure 46 are maps shared by Mr. Mau-Espirito of his properties he is currently restoring and waterways that may potentially impact his cultural practices.

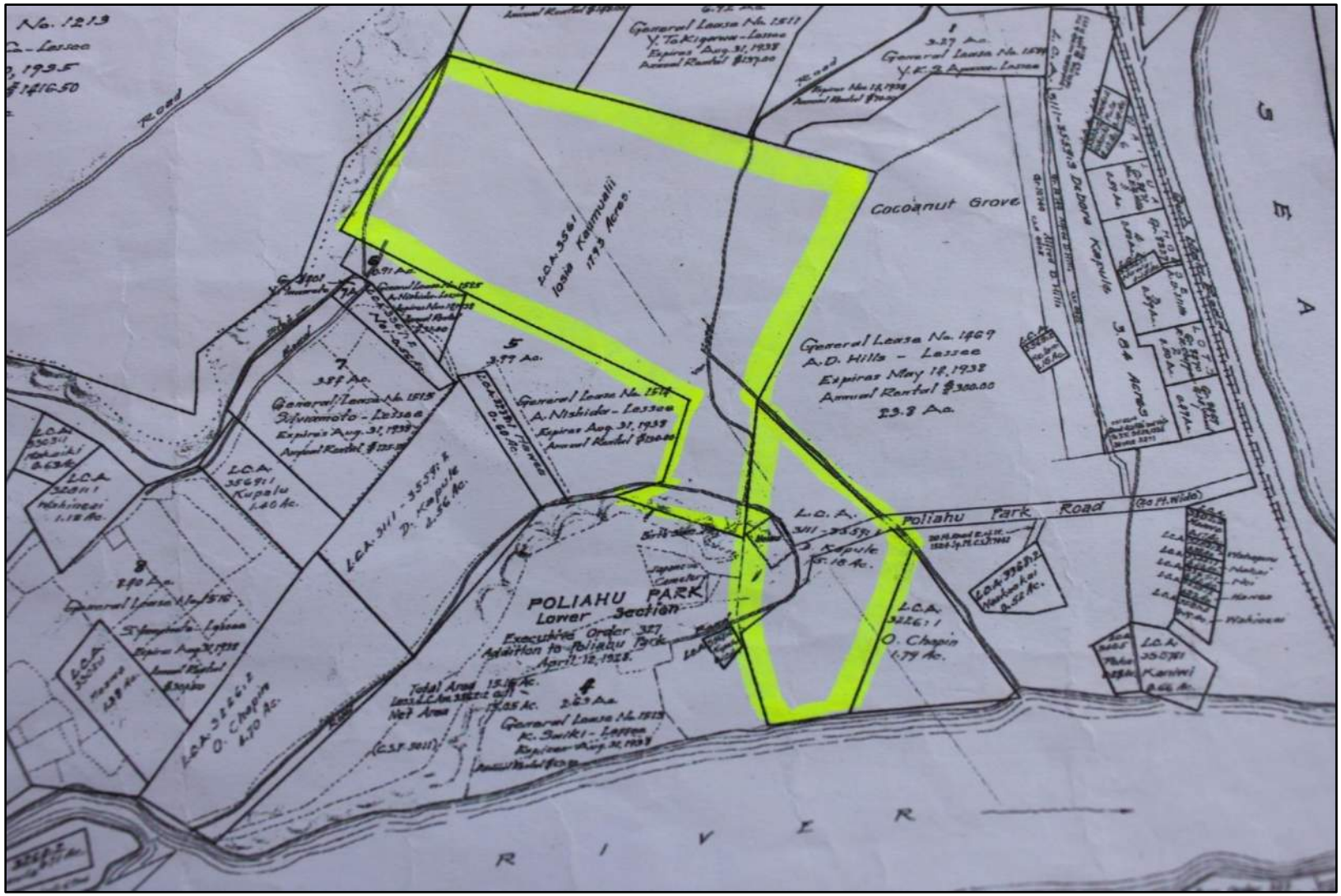

Figure 45. Photo from Mr. Noa Mau-Espirito’s private archive; a map highlighted with properties Mr. Mau-Espirito claims to have descendant ties to (CSH 2017)

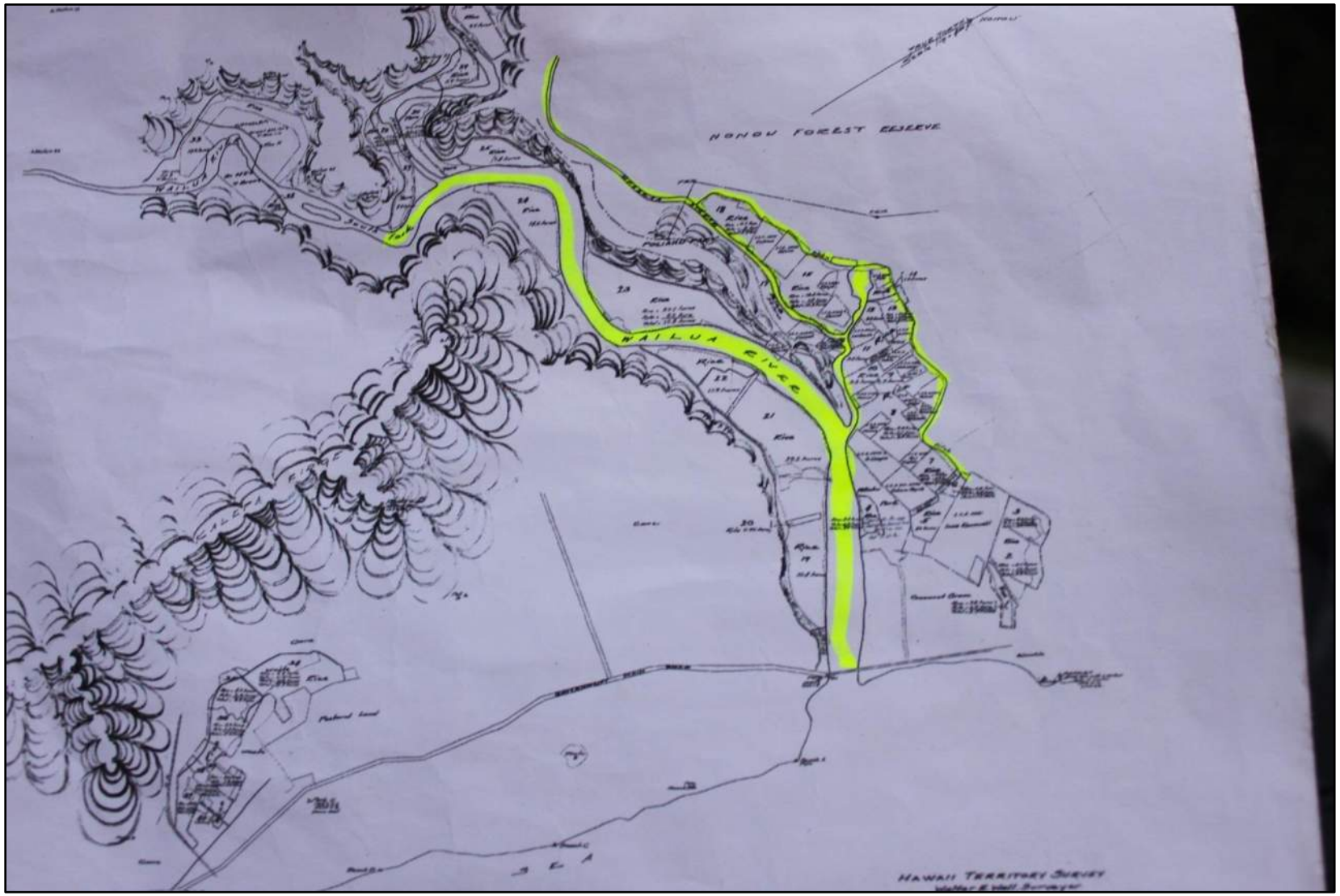

Figure 46. Photo of waterways (highlighted in yellow) Mr. Mau-Espirito utilizes and that will impact his *lo‘i* (CSH 2017)

6.8 Response from Felicia Alongi Cowden

CSH met Ms. Felicia Alongi Cowden on 20 July 2017 at the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a. CSH sent a community consultation letter and figures of the project area to Ms. Cowden on 24 July 2017 and a follow-up email on 7 August 2017. Ms. Cowden notified CSH on 9 August 2017 that she would be submitting testimony in the near future, however, a recent death in the Kaua‘i community may be delaying responses. Ms. Cowden emailed CSH on 17 August 2017 with the following statement:

> I have concerns about the 65-year lease of water rights of the North Fork Wailua River to the Kauai Island Utility Cooperative for hydropower production.
>
> It is critically important that a scientifically determined amount of the flow is year round such that the Run of the River always occurs. It is not my area of expertise, but my guess is that would be somewhere between 25-50% of the water.
>
> I am writing this letter in two capacities; one as a youth educator in a program I run called Akamai Learning and also as a community advocate/educator on Kauai Community Radio with my community affairs talk show program, Kauai Soap Box. (4-6 p.m. Tuesdays)
>
> Perpetuated cultural practice requires holistic opportunities, they are not specifically isolated into one river bed. They range from the mountain to the sea. Wailua is an important series of Ahupua‘a, a number of which are unnecessarily interrupted by the series of water diversions in the upper north fork of the Wailua River. Every diversion should allow a portion of the water to continue its natural flow and to return the water much father up the stream, shortly after the power plant or at least a significant portion of the water. State law protects the flow of the river in the public trust.
>
> In my role as a community advocate, I have fielded great distress from callers both on and off the radio about what has often been 100% water diversion on moderate to low water flow days. This unnecessary complete taking of water creates profound anger particularly among the kanaka cultural practitioners who have utilized this water for farming, fishing, lei material gathering and more. The complete diversion of the water deeply impacts the viability of the Department of Hawaiian Home Lands availability to people who have waited a lifetime to be on the list. There were many loi kalo that can no longer be cultivated due to no water or have long since been built upon.
>
> There are very few meaningful methods for particularly the emerging generation to continue a true lifestyle of cultural practice that is not criminalized. Water and land availability is the jugular of this problem. People are criminalized for their practices and forced to live a life that is separated from the land. I regularly attend criminal court that has a majority of people with part Hawaiian ancestry with most of their offenses either centered on poverty or politics. It is also the case that many people without Hawaiian blood share the deep concern and outrage that the water is completely diverted for many days of the year. This diversion incites a level of anger that can be criminalized.

The Cultural Impact Assessment process is a strong example of the marginalization of cultural practitioners. It takes strong administrative skills to be able to participate in the written process. The cultural practitioners are not typically people whose skills sets are strong on writing within the narrow framework that is allowed. I counted twenty-two people who attended our hike to the diversion on July 20, 2017 that physically and verbally demonstrated their commitment to the culture. This video documents that [https://www.youtube.com/watch?v=9CsO7P_dhbc]. There were two more vehicles of practitioners that missed our meeting point that would have attended. It was clear that these individuals live a lifestyle that is inclusive of kalo planting, farming, fishing, hunting, medicine and and lei gatherers. Their work lives include professional hula, olelo, performance, outrigger river tours, food wholesaling and more. Many are part of the Namahoe wa‘a or sailing canoe from Kauai, even some who were on the Hokulea global voyage. Their physical presence needs to be counted as testimony in this Cultural Impact Assessment. That very week the cutting of roughly 140 9 foot papa kui ‘ai boards for pounding poi were a group project in five locations on the island, including Wailua Nui Ahoano. The perpetuating of the active culture is alive and trying to thrive. The nature of the questions in the Cultural Survey are history based and not an accurate reflection of a holistic culture working to not only survive but to thrive. We need to ensure that all of our rivers flow and follow the example of the Waimea River as it begins to have its water returned to the traditional uses that were not able to thrive in the 110 years of having 90% diversion.

In contrast, the business entities that have been able to claim 100% of the water on the light rain days can hire lawyers to follow the narrow criteria of the permitting process.

This history of Wailua is profound. Randy Wichman has done a simplified talk [https://www.youtube.com/watch?v=04HUMqa4fnE&t=4319s] that is worth review for an introduction to the rich history that is a part of Wailua. Every year with my middle school students of Akamai Learning, we include several weeks of studying Wailua’s history which includes the issue of the diversion and walk a distance in both directions to observe the striking difference between the upstream and downstream areas of the concrete diversion. Now that it is broken open, there is a visible healing in the downstream area. We learn about how the villages had once had flowing water within them. We can see from the geology that the waterfalls were once much more flowing and where the waterways had brought water through the villages that are now dry. An example is on the mound to the left of what is called Sacred Falls. There is evidence of earlier times of cultivation all throughout the Wailua watershed. The reason there is less cultural practice in these areas is that the culture is barely allowed to continue; certainly living in the area is prohibited which essentially limits the utilization of the area. Hunting needs to be encouraged for the preservation of the watershed by limiting the proliferation of the wild pigs.

Please let the Cultural Impact Assessment reflect the continued interest of the emerging generation to continue a more robust cultural practice than has been

allowed in the past fifty or more years. The language, the knowledge and the interest is on the rise and having a renaissance.

6.9 Response from Kanoa Mayer

Mr. Mayer emailed CSH on 4 July 2017 with the following:

Aloha kāua e Nicole,

‘O wau iho nō ‘o Kanoa Mayer, he kupa o ke ahupua‘a ‘o Olohena, moku o Puna. Eia mai ku‘u mau mana‘o no ka lawe ‘ia ‘ana aku o ka wai mai ke kahawai nui aku. ‘O ka mea mua, no ke aha i kali ai he 11 makahiki e niele mai ai i ko ke kaiaulu no kēia EIS? ‘O ka pololei, ua hana ‘ia kēia ma mua o ka ho‘omaka o kēia hanana. ‘O ka lua, hō‘ike ‘ia ma ka palapala ‘āina ke kahe mau ‘ana o ke kahawai ma kona wahi kūpono, eia nō na‘e, he mau manawa o ko‘u pi‘i ‘ana i laila, a aia ka wai a pau loa ma ka ‘auwai, ‘a‘ohe kulukulu iki e kahe ana i ke kahawai. Maopopo kāua, ‘o ke ‘ano Hawai‘i, ‘a‘ole loa e lawe i ka wai a pau loa mai ke kahawai mai. Ahuwale kēia hana ma ka lo‘i kalo o ke au kahiko, ho‘ohana ‘ia ka wai, a ho‘iho‘i ‘ia i ke kahawai. E lawe i ka mea e pono ai wale nō, a waiho i kekahi no kekahi po‘e. Pono loa e waiho ‘ia kekahi wai no nā meaola o ke kahawai, ‘o ka ‘ōpae ‘oe, ‘o ka ‘o‘opu ‘oe, ‘o ka i‘a nō ho‘i ‘oe. Ke lawe ‘ia aku ka wai a pau, ‘a‘ohe wahi e noho ai ua mau meaola nei, a make. I ka ho‘iho‘i ‘ia aku o ka wai e nā kānaka kū i ka pono, ho‘āhewa wale ‘ia, me he mea lā no lākou ka hewa. He mea kēia e pono loa ai e kūkākūkā a ho‘oponopono ‘ia ho‘i.

Mahalo ‘ia na‘e kou kōkua i ko ka lāhui.

Aloha Nicole.

My name is Kanoa Mayer, I am a resident of the Olohena ahupua‘a, in the Puna district. Here are my thoughts concerning the diversion of water from the North Fork Wailua River. My first concern is that if the MOA was issued in 2006, why has it taken 11 years to seek community input? This survey should have been conducted years ago either before or at the beginning phase of the project. Secondly, according to the map, a healthy amount of water remains in the stream, while some of it is diverted into the irrigation ditch. However, I have been to this location on multiple occasions when all of the water (100%) from the stream is diverted into the irrigation ditch, leaving absolutely nothing to flow into the stream‘s natural path. I believe we are both aware that in Hawaiian practice, you do not take all of the water and leave none for the people and living things in and downstream. This can be clearly seen in the lo‘i system, where the water enters the lo‘i and is put directly back into the stream. Water must continue to flow in it‘s natural path and be left in the stream for Hawaiian organisms, such as ‘ōpae, ‘o‘opu, and other types of fish. When all of the water is diverted, there is no water left in the streams for them to survive or to return upstream for spawning, and eventually die off. When some of the local residents went up there and returned some of this water to the stream, they were blamed for vandalism, as if they were the ones who were causing harm to the stream. With that being said, these are a few of the things that should be discussed and eventually taken care of. Mahalo for your kōkua.

Na‘u nō,

Na Kanoa Mayer

6.10 Response from Kyle Gilmore

Mr. Kyle Gilmore attended the *huaka‘i* to the *mauka* regions of Hanamā‘ulu and Wailua Ahupua‘a on 20 July 2017. Through several email exchanges starting on 18 August 2017 through 24 August 2017, Mr. Gilmore submitted written testimony to CSH:

> I have never been to Kauai before. I grew up in Kaneohe Oahu but left 30 years ago because I found that if I stayed I would probably end up in Halawa Prison for most of my adult life due to the lifestyle I was living at the time.
>
> I have spent the past 30 years trying to make enough money so I could come home and take care of my Mother and siblings. We were always very poor in our childhood days. It was a confusing thing because my mother used to tell me that we were descended from a line of Hawaiian Royalty that was so powerful that it had to be kept secret. She used to tell me stories about how the Princess we came from needed to be hide out in our Family land in Kahuku. That we were in danger because of other Ali’i that were trying to protect their interests.
>
> It never made sense to me because we were dirt poor and my uncles and grandmother was so hateful and abusive towards my Mother and most of her kids.
>
> I have worked in the Music Industry most of my life. I have lived in Japan and Europe and have been able to work with some of my favorite artist and have a lifestyle I could only dream of when I was a kid in Hawaii.
>
> All I have learned from that is that if you acquire a lot you have to spend a lot of time defending it. I never came home and took care of my Mother. She passed away with out me by her side. One of the biggest disappointments of my life. The thing about money is that it evicts Aloha and invades the space it is meant to live within us.
>
> I took a DNA test that connected me to all other people that did the same and made their trees available. That gave me proof of what my mother told me. I have DNA match to every royal line and a few High Priests, but not Kamehameha 1.
>
> I have spent the past 2 years trying to deduce who I come from through these DNA connections and am very close to confirming them. Its difficult when someone shows up suddenly and has solid proof to claim kinship to people like the Kawananakoa’s amongst others.
>
> Through my dna test I have been able to distinguish who my real Family are and through Facebook I have been able to introduce myself to them.
>
> I checked my Facebook one day and saw a video that Charles Hepa put up calling for all descendants of the Kuleana claim in Coco Palms to come out and help them. I felt he was directly talking to me. He put his phone number out there and I called

to tap. We talked a little and then he said he had to go cause they were being raided. I knew I had to do something to help.

Months went by and Kauai seemed to be calling me even louder as days went by. I began to lose weight and couldn’t sleep. I just couldn’t stop thinking about Kauai.

My Mother used to cry when I was young and tell me about how we belong on Kauai but she could never find the means to get us here. Today I understand why Kauai was so important to her.

The call from Kauai got over bearing and I called my business partner and told him what was going on. He is my best friend also and knew me for a long time and understood I needed to go. He and his wife bought my everything I needed to come here, put it all in a back pack and took me to the airport. It has been interesting if anything.

As soon as I got here they set me up at the beach hostel in Kaapaa. The next day I woke up and went straight to Coco Palms and met Charles. It was great he came out to meet me and showed me all the things they have been doing. I felt so grateful that they were willing to take me in and show me these things because I was a stranger, grew up on Oahu and was ignorant to the thriving culture that is here on Kauai.

They told me they were going on a hike and I could come if I wanted. I had no idea what was going on and felt uncomfortable but a lady that wasn’t Hawaiian but supported their efforts encouraged me to go a long. I am so grateful to her.

When we got to the meeting point a older man walked up to me and said you are my Family. It seemed like he just knew this and we jumped in the back of the truck and headed up to the place we needed to go.

I was amazed at the beauty of every thing. There was a younger guy teaching me things he knew about what it was to be Hawaiian and the man I met would just look at me and smile. Then he would start telling me stories about who we come from and what was important to them. Tears came to my eyes 3 times just driving up. It was a profound and confirming experience for me.

When we got to where we were going to park the older man stayed my my side telling me things he knew that I needed to know. He suggested I take my shoes off and hike barefoot and I did and it immediately intensified. We started to walk off alone separate from the crowd as he continued to teach me the things I needed for that moment.

He explained what was going on. I thought we were just going on a hike but it was about control of the water source here on Kauai. He told me people have been coming up there and building dams to divert the valley farmers water to new land developments. They were doing this with out having any right to do this. I realized there was people there filming us and it was a big deal. I was so grateful to be there.

Things started happening to me as I walked up there with this man. My heart got lighter. My mind opened up. My body got stronger. I didn’t have any water with

me and didn’t need any for some reason. I drank out of a pond that my other Cousins suggested I drink out of. I had three swallows and didn’t drink anything else till about 9 pm at night.

When we got to our destination I was awestruck. I had to sit down and look at the water and tears came flowing. It seemed all my Cousins say this and started standing in front of me so no one would see or take a picture of me in this condition. I felt protected.

They all started to head back but I knew I had to go further. I went on and saw a glow coming from the next valley and continued on. What I eventually saw was a golden mist settle in a nook of the valley. Tears came streaming down. I remembered the man that was helping me and did not want them to worry about me and started to run to catch up with them.

When I found the man he said with a look of awe in his eye, “That is where the village was, you need to come back up here someday”

And with that I have decided to make Kauai, the Kauai that my Mother said we belong my home, and I have decided that this work they are doing I will support to the fullest because it is in line with what my Mother used to say and what I have decided to start living my life in reference to.She said, Never let money become more important then love, to always live with Aloha in my heart.

6.11 Response from John Ka‘ohelauli‘i

CSH received personal testimony from Mr. John Ka‘ohelauli‘i via email on 17 August 2017. Below is his *mana‘o*:

Thank you for accepting my testimony about the water diversion in the Wailua Valley on the island of Kaua‘i

I am a cultural practitioner and a beneficiary of the Department of Hawaiian Homelands. I am against any water diversion or reallocation in the Wailua valley.

There are many cultural and historic sites in the Wailua valley. As a cultural practitioner in the art of the ‘Ohe Hano Ihu. The Wailua valley is historically known for the sacred place called Pihanakalani. Any disruption in this valley will cause unrepairable damage to not only Pihanakalani, but to the other cultural and historic site that still may be unknown today.

The upper Wailua valley is one of the areas that have the rare type of Bamboo used by Kauakahiali‘i to attract Kaililauokekoa with the ‘Ohe Hano Ihu.

As a Native Hawaiian and a beneficiary of the Department of Hawaiian Homelands living on a residential lot in Anahola, I am also concerned about the water that will feed the the Wailua Homestead lands in the future. We as native Hawaiians need our water so that our native Hawaiian beneficiaries in the near future can live on those lands.

> Thank you for receiving my testimony on my wish NOT to divert or reallocate the surface water that runs in the Wailua Valley on the island of Kaua‘i.

6.12 Response from Dr. Mehana Vaughn

CSH received personal testimony from Dr. Mehana Vaughn, Assistant Professor of Sustainable Watershed and Coastal Management at the University of Hawai‘i at Mānoa, on 11 September 2017. Below is her *mana‘o*, which was originally sent to Kumu Kēhaulani dated 18 October 2016 (also available in Appendix C):

> I am still ma‘ana with our huaka‘i to Wai‘ale‘ale and am finding it hard to put all I feel into words. I am so grateful to have seen these places and for the gracious tour by Brad Rockwell and yourself. I appreciated Brad‘s thoughtfulness and knowledge of the system and learned so much. Here are some thoughts related to the diversions of Wai‘ale‘ale water by KIUC.
>
> **Ka waiwai o Wai‘ale‘ale, ka wai kini:** The beauty and power of the water, and of Wai‘ale‘ale was astonishing. The opportunity to see our mountain so close, from so many angles, to learn names of each of her tributaries, and to stand so close to Kawaikini was amazing, as was getting to dance Kaulilua, a mele composed to honor the dignity of this mountain, just there in her sight. As hula practitioners and Hawaiians we dance and chant for places, and call their names. To be able to do so in those places, and to watch their response, is so important, providing more depth and understanding to our practice, and, I believe, mana to these beloved wahi.
>
> **Wailua River North Fork:** The primary issue of concern, which should be addressed immediately, is the complete drying of the north fork of the Wailua river. We are taught that water is the lifeblood of the ahupua‘a, keeping circulation healthy and carrying needed nutrients to the ocean. The image of the dry stream bead, encroached by invasive vegetation, visited by rats and cattle egrets showed an ecosystem out of balance, and a cultural harm to our reverence for water and its ability to flow. Hawaiian manowai were made to adapt to the flows of the river, to divert less water when there was lower base flow, and to give way in heavy flooding. While the current dam may divert less than 50% of the annual average stream flow when high flooding days are included, it is diverting all of the water and leaving the stream bed dry many days out of the year. The day we visited was rainy, as was the day before, yet the channel below the diversion was dry. I suggest removing the existing dam as soon as possible and devising a replacement system in which the diversion always leaves more than half of the water in the stream, never taking more than 50% of the daily flow. Perhaps lava rock could be used and not cemented, just as our kupuna built their manowai.
>
> **Precautionary Principle and Adaptive Management:**
>
> Multiple sources state that Hawaiians never took more than half of the water from a stream channel (Nakuina, Tong 2014). However, it was much more complex than a simple figure:

Nakuina affirms, ‘no auwai was permitted to take more water than continued to flow in the stream below the dam. It was generally less, for there were those living makai, and drawing water from it, whose rights had to be regarded.’[50] This meant that you always left more water in the stream than in the ʻauwai, because there was usually more than one ʻauwai on any given stream. Therefore, customary water allocation considered the water rights of everyone in the area, as well as the ecosystem within the stream’ (Tong 2014).

Hawaiian ‘auwai primarily returned water back to the stream from which it was diverted, after it had flowed through the lo‘i kalo, so most diversions were not permanent removals of water from the watershed and stream channel. Because this ditch moves Wai‘ale‘ale water across multiple ahupua‘a, and as far as Koloa, I think that a more precautionary figure than just under 50% is in order, no more than 30%. In addition, with already decreasing stream flows and well levels, as well as forecasted longer periods of dry weather and more concentrated precipitation events due to climate change, leaving water in the streams to facilitate percolation and ground water recharge seems vital. Utilizing the precautionary principle also is supported and in some interpretations required by the Waiahole decision. I would argue that more important than the specific number, is identifying the purpose and value underlying native Hawaiian care management approaches and trying to emulate them. Kalo farming kupuna ‘Anakala Eddie Ka‘anana planted beds of hoio fern to filter the water from his Pālolo lo‘i before it returned to the stream. Some form of water quality monitoring could be useful to understand how temperature, turbidity and other indicators are changed by the diversions and to test water before it is removed from the system and just before it is returned.

Access with Kuleana: I felt so very lucky to stand in the places we went, awestruck by the views, and new sense of our Kaua‘i that they provided. I was cognizant as were many in our class that without KIUC‘s presence, use of the water, and hosting, without this permit application, we would not have gotten to go. It also felt wrong that so many visitors go for recreation, and because they can pay the price of admission, while so few residents are able to. To me the area needs and provides an opportunity to develop models which offer access with kuleana. For example, groups could come for educational and cultural purposes, and in exchange provide work such as hands on restoration of natives, maintenance of ditches or roads, place names and mo‘olelo research, or creation of curriculum about Wai‘ale‘ale for island schools. These are not places that should be visited by multitudes for no purpose or just for fun. At the same time they should not be closed off completely as they are such amazing sights of learning and sustenance. Also, they must take a lot to upkeep.

Hawaiian mo‘olelo and historical accounts (Malo, Handy, Tong) describe famers and other water users working to clean auwai systems from ma kai to the source, with all users participating, and with water allocation predicated on the dedication of work to take care of it:

‘This was consistent with Nakuina’s explanation, which noted that the amount of water one was allotted depended on how much labor one put into working the land. This would include how much work one contributed in the larger community projects, such as the building of an ʻauwai, and how much water one needed to irrigate the amount of loʻi she customarily cultivated. Water was available to all, as long as s/he used it sufficiently and contributed to community projects.’

How might the idea of rights to utilize and access water being predicated on contributions of care taking and responsibility apply in this case? Water was not banked, but put to beneficial use? Might allocation of Wai‘ale‘ale water be based upon public benefit. Therefore, in addition to legally protected uses like taro farming and Hawaiian homelands, other uses might receive more allocations such as production of food for local consumption vs. export, or affordable housing vs. luxury subdivisions and golf courses, or for those who work on stream restoration and enhancing the ecosystem.

Kilo and Monitoring: Managed, limited access with kuleana may also play a part in another key need we saw which was enhanced monitoring. It seemed important to have more holistic assessments of each stream‘s health from mauka to makai. On our trip we were able to see points along the way, but it seemed important to understand what happened below and above these points. For example, how much water remains in Waikoko stream after the stable storm flow ditch? There was plentiful flow the day we were there continuing on below the Waikoko diversion, but how long does that last? How are o‘opu populations in every stream? How much water remains in Waiaka, Ili‘ili‘ula, Kaulu, Palikea, Kamo‘oloa and the other tributaries diverted by the North Wailua ditch below those diversions. The two existing water flow gauges are obviously quite important. Adding more so that each stream is monitored above and before the diversions would be useful as would aerial photos or drone flights along each stream mauka to makai.

At the same time, monitoring really depends upon people, not just instruments. Most kalo farmers I have worked with make it a point to check their water source daily, and to organize their lives and tasks accordingly. Wisdom is built by observing area water sources not monthly or annually, but daily in their many moods throughout the course of a year and over many. The power plants and need to hire crews to maintain them struck me as a wonderful opportunity not simply just to hire locals but to train them in understanding of wai, applied hydrology, and the work of serving as kilo, observers, and kahu, or caretakers of the water.

Cultivating Pono: The Waiahi area and stream was so beautiful, and so different from the north fork, so full of water, moistening the air all around it. I wonder what Waiahi stream would look like without the diversions from the north fork and other branches, part of which enter Waiahi after the power plants. What might effects on Waiahi‘s flows be if flow is restored to the north fork? At this point, and with such an extensive system of diversions, what is the natural state of the ‘āina and resource?

The ditch systems are magnificently designed and completely staggering to imagine building and engineering. I would not advocate ending their diversion of water completely or destroying these systems which so many hands and kino gave so much to construct. I did not hear hardly anyone on our trip say that they felt all of the water should stay in the streams, but that there is a need for balance, and for re-balancing, particularly in the case of the north fork.

It seems there is plenty of water. I appreciate that the power plant water returns so quickly to the stream, though it is diverted again not far from the power plants, another area it was impossible to assess without seeing. The areas where the water returns appear healthy and un-impacted by its use for hydro. The answer seems not all or nothing, but a more balanced distribution which always responds to the changing ecosystem and human needs without simply assuming current states of diversion, consumption, or land ownership. Water should not be diverted simply to be banked.

Consumption as a Core Cause: Because the hydro only provides 1% of Kaua‘i‘s power, it does not seem essential to have this use, nor does the use seem to be detrimental. Seeing it made me wish that our co-op would start to think in terms of more distributed systems, because smaller decentralized hydro, solar, and wind systems, in which neighborhood or household power was provided locally, could transform energy provision on our island, and reduce the need for the current fuel burning plant which provides 80% of current energy needs. The whole trip made us think about limits and needs, and the importance of knowing where our water and power come from, being cognizant of how we use these precious resources, and using less. I felt, that, though KIUC may not need the hydro-power to meet Kaua‘i‘s energy needs, I am grateful the utility is there to connect all of us co-op owners as a community to this water. Their presence makes us all collectively responsible, dependent, and provides a means of connecting to and taking responsibility for our use of the resource which would likely not exist without them.

Cultivating Ecosystem Health:

I have not seen extensive studies of o‘opu and wī in the area, and I know that these have not been done for all of the streams. In the north fork, my understanding is that there are no o‘opu above the diversion. This is a violation of state law, and most unfortunate. Rather than meeting the lowest possible standard of having o‘opu present, we should turn to stories of Kaua‘i kūpuna who, as recently as the 70s recall streams black with o‘opu, every species, nākea and alamo‘o large enough to fit an adult‘s fist in their mouths. Such images of abundance should inspire efforts to restore it, so that our children will not only see o‘opu but see healthy populations of many fish reaching their most productive size classes. Let us work for a time when it is appropriate to consume these fish once more, and when young people our familiar with their life cycles and patterns. The famous waters of Wailua, the largest river on Kaua‘i and in much of Hawai‘i are a critical place for restoration not only of o‘opu but of wī and ‘opae, of pīnao and other species which are not eaten but indicate ecosystem health, and for cultivating true abundance.

Could there be systems of rotational diversions for some of the streams? Perhaps some water (an amount far less than 50% which depends upon studies of the amount of flow required for optimal health of stream life) from Waikoko and Ili‘ili‘ula streams could be diverted, then switch to Waiahi and Waiaka. In this way, no stream would be even partially diverted all of the time, but all would have times of heavier and lighter flow. This is similar to how neighboring ahupua‘a fisheries took turns closing species, allowing residents in the closed area to harvest from the next ahupua‘a, then switching to rest the species where it had been harvested, so that both could have times to replenish.

Another key issue is the need to consider the entire ecosystem holistically, as our kūpuna did, mauka to makai, from the forests to the sea, from Kawaikini and the peak of Wai‘ale‘ale to Ka‘iwa. Research with indigenous peoples worldwide emphasizes that resources, were sources, considered not only connected to and a part of human communities, but also linked to one another. Contemporary management focuses on forests as if they were distinct from streams, aquatic resources as distinct from aquatic recreation, and individual diversions, ditches and pipes individually instead of as an interconnected system of cumulative impacts. Cumulative impacts assessment is one of the most difficult and ignored areas of environmental management, however, considering every diversion, historic and existing, on every tributary, together as a whole system, is crucial to achieving the holistic ecosystem-based approach of our kūpuna.

Pani: In conclusion, complete dewatering of the north fork of the Wailua stream is of utmost concern and water must be restored immediately. In addition to violating legal precedent in Hawai‘i protecting water as a public trust resource and requiring maintenance of some level of in-stream flow, dewatering is a cultural violation out of keeping with customary approaches to water management and with cultural standards of reverence for wai. The stream without water is a dramatic and disturbing site, as is the predominantly invasive vegetation lining the empty stream bed in contrast to the presence of more native forest on the other Wai‘ale‘ale branches which maintain water flow. Further the waters of Wai‘ale‘ale are magnificent beyond imagining. It is vital to find ways to engage responsible community members in further learning about these places and systems, in efforts to help care for them, to conduct ceremony, visit, monitor, and participate in working towards more balanced approaches to mālama all of these waters.

Mahalo a nui loa for engaging and sharing with us. We are forever changed as individuals and as a class. All of our students returned to class Monday wide eyed, full of questions, moved, staggered, and amazed by our day. Mahalo pālena ‘ole. Please feel free to contact me if I can be of further assistance.

6.13 Response from Kumu Beverly Muraoka

CSH sent a letter and figures of the project area to Kumu Beverly Muraoka on 9 May 2017. CSH sent a follow-up letter and figures on 22 June 2017. On 12 September 2017, CSH received a letter from Kumu Beverly (also available in Appendix A). Below is Kumu Beverly’s *mana‘o*:

I apologize for the late response in regards to the subject [CIA for the KIUC Blue Hole Diversion Long Term Lease Project]. If it is too late, please know my comments are held deep in my beliefs, experiences and for the record, deeply rooted to my upbringing in respect to Wailua Ahupua‘a.

I hold a ‘noe‘au’ dear to my heart learned from the late Kumu Kula, and La‘au Lapa‘au Kahuna, Levon Ohai—PARENTS WONDER WHY THE STREAM(s) ARE BITTER WHEN THEY HAVE POISONED THE FOUNTAIN—meaning what happens at the top affects the bottom and vice versa.

This sacred river has provided food for centuries to families living in Wailua and those that fish in it. It has provided economic success to those conducting tours and now more than ever, kayaks and water ski activities. Yes, the oil, gas, and wastewater have impacted this sacred gift from KeAkua and while I’m not privy to all of KIUC’s activities we definitely need to ensure that the continued requests that it need to conduct hydroelectric activities be monitored with expertise and high technology formats to effectively provide those of us living “downstream” will not be left out on what was “our way of life long ago.”

Our ‘Practices’ include pepeiao from the hau bushes, crabs (usually Samoan), fishing of ‘ama‘ama (mullets) barracuda, papio, and frogs. The pili grass, hau itself, rice reeds, etc. make for all of the precious things used for our people living in Wailuanuiahoano.

We trust this is helpful in resolving the impact that this will cause should the project be agreed between OHA (who knows very little) and KIUC.

It is my desire that Cultural Surveys contact some of the ‘old-timers’ who, regretfully, are passing rapidly and taking their knowledge with them.

You must have contacted the Watler Smith, Jr. ‘ohana, Valentine Ako, Kimo Fernandes and ‘ohana (Kamokila Village) and if not, these are suggested families you may want to interview. Mahalo nui loa.

6.14 Commission On Water Resources Management (CWRM) Testimonies

The following section are testimonies submitted to CSH by The Joule Group. These testimonies were submitted in June 2018 and August 2018 to CWRM. The Joule Group has shared these additional testimonies with CSH, available below:

6.14.1 Phil Tacbian

Aloha. Phil Tacbian. Presently, I’m a member of the Board of Directors at KIUC. Previously, I served on the State Land Use Commission, Kaua‘i County Board of Water Supply, and Hawai‘i Water Works Association. The Wailua River area has been a fixture in my…to me, throughout my lifetime, as a child born and raised in the area, and I’m still there. The waters of the river have always, to me, been plentiful. It’s been a place for us to play, for recreation, fishing, crabbing, and also in the upper area is the place where the hunters access the prime hunting grounds.

And at the same time, I know that the waters of the river were used as a resource for agricultural purposes during the Līhu‘e Plantation days and also for energy production when the hydro was built many, many years ago in the area. And all of this was made possible because of the diversion at Blue Hole. And not only that, the ditch from Blue Hole to Waikoko is also a great place for kids and families to go tubing and enjoy the waters of Wai‘ale‘ale. And my 60th class reunion, we had our group go up there and enoying the tubing. And based on our age, we were grateful that we did not have to call 911, but everyone enjoyed it to the max. And anyway, from my perspective, there’s always been enough water to satisfy all of these uses. And I’m very grateful today that the water commission is settling the inflow stream standards so that generations to come, my children, my great-grandchildren, there will be enough water for everyone. Mahalo.

6.14.2 Shawn Shimabukuro

My name is Shawn Shimabukuro and I’m with Grove Farm Company. We are made up of three sugar plantations, the original Grove Farm Company was founded by George Norton Wilcox over 150 years ago. Today Grove Farm includes the former Koloa Sugar Plantation and portions of the former Līhu‘e Plantation. The farmable lands were once primarily devoted to sugarcane production. The Grove Farm of today continues to operate and maintain the aging and complex water systems that once supplied a crop that required a lot of water. With the demise of sugar, the necessities to impound water was significantly reduced and water was returned to the stream and other natural waterways. For example, the usage alone in the Hanamaulu Ditch dropped by 44-percent when sugar ended. As much as Grove Farm has been condemned by few, the water that flows through the streams and waterways are actively used by farmers, ranchers, civic centers, commercial and industrial entities, and more importantly, these water systems provide for our daily needs. Showers, cooking, washing our clothes, and so forth. With access to new groundwater being a challenge in the Līhu‘e area, the surface water from the Kapaia Reservoir a source of the Waiahi Surface Water Treatment Plant which purifies water for drinking and that serves over 15,000 residents from Puhi through Kapa‘a. These water systems also provide for commercial entities such as Costco, the Kukui Marketplace. Irrigation water is also supplied for civic uses such as the Līhu‘e Beautification Project that runs along Ahukini Road and the Kapule Highway, the State Judiciary Complex, police station, the Vidinha Soccer Field. The irrigation water wil also provide for the Adolescent Treatment and Healing Center. It provides water to Kaua‘i Community College as well as Island School. So all of these uses result in a significant conservation of our potable water resources and keeps our island green. The water has also provided for industrial uses including KIUC’s Kapaia Water Plant and the Global Algae Innovations research facility. You heard from Kaua‘i Backcountry Adventure who uses the ditch system for their tubing activities and in turn it provides for numerous jobs and related economic stimulus. KBA has also been a great partner in maintaining the ditches, tunnels, and roadways. And finally, agriculture. Agriculture was and will always remain at Grove Farm’s core. In the Līhu‘e area alone, we have over 3,800 acres actively

used by 65 farmers that benefit from these water systems. These include ranchers, vegetable farmers, such as taro, mixed greens, much of which is sold at our local farmers market and can be found in our local restaurants. We have a variety of fruit farmers, tropical flower growers, landscape nurseries. All of these agricultural activities provide jobs and contribute towards a sustainable food source. Water is also provided to the State’s Agribusiness Development Corporation lands and the system once delivered water and it’s still able to provide water to the Deparment of Hawaiian Home Lands in Wailua when it is needed. There is no reason why Grove Farm would utilize any more water than what is being currently consumed. As it is, this complex water system requires daily monitoring and maintenance, and it comes at a very high cost. We recently repaired the Kapaia Reservoir Tunnel at a $1.1 million cost. This tunnel serves many commercial entities, provides for our farmers and ranchers, as well as potable drinking water. Today’s Grove Farm team is a team of 13. All of us have roots on Kaua‘i and we were raised on this island, and we take our stewardship of the land its resources very seriously. This team of 13, along with many of our contractors and partners, pride ourselves in taking care of these resources as we want to ensure that they’ll be there for future generations. Our vision is really to build a sustainable Kaua‘i. Thank you.

6.14.3 CWRM Notes on Arryl Kaneshiro Testimony

Arryl Kaneshiro, rancher and project manager for Grove Farm testified that water is important and understands the predicament. How do you balance and accommodate all the different needs and uses for water and how do you weigh one of those uses over the other? Family has been in agriculture for four generations. Great-grandpa started a pig farm that is still operating today, grandpa owned a chicken farm and later grew fruits and vegetables for the farmers market, while he and dad have a ranch of over 700 sheep. At Grove Farm, responsible for managing company’s 37,000 acres of land and maintaining infrastructure including miles of the irrigation system and over 100 agricultural tenants and 3,800 acres of productive agricultural lands would be affected by the Commission’s decision. Agricultural activities consist of cattle and sheep ranching, farming a variety of crops including taro, mixed greens, ginger, fruit, sod, and native plants. The water also feeds agriculture on State Agribusiness Development Corporation (ADC) lands and, when they are ready to receive water, DHHL lands in Wailua. This water also benefits government facilities such as the Airport’s Līhu‘e Gateway, the County’s Judiciary Building, Police Department, Adolescent Treatment and Healing Center, Vindinha Soccer Fields, and Kaua‘i Community College.

Section 7 Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana‘o* and *‘ike* with CSH whether in interviews, brief consultations, or in person. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

7.1 Nicole Hoku Cody

CSH conducted a group consultation meeting at the Kaua‘i County rotunda on 20 July 2017. Approximately 15 people attended the group consultation including Nicole Hoku Cody, who is from Hawai‘i *pae ‘āina* (archipelago). CSH conducted a phone interview with Ms. Cody on 25 July 2017.

Ms. Cody has worked at Papahānaumokuākea Marine National Monument and has done extensive fieldwork there for the Joint Institute for Marine and Atmospheric Research (JIMAR), National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (FWS), and Department of Forestry and Wildlife (DOFAW). She was also the Kaua‘i Campaign Manager for the Expand Papahānaumokuākea Marine National Monument Coalition where she conducted research to better understand the relationship between the Kaua‘i food market and sustainability with the longlining industry. Some of her work entailed a dedicated effort consulting with local fishermen to better gauge the influences of the longlining industry to both their fishing practices and food at home. Ms. Cody shared that during her field surveys, she recalled meeting most participants at the mouth of the Wailua River. Her observations included fishermen not wanting to clean their fish in rivers, marshes, and brackish waters downstream of activities that had negative environmental impacts such as pesticide spraying, illegal dumping, etc.

Ms. Cody pointed out that during the group consultation meeting, another community member made a comment about dancing *hula* to “Maika‘i Kaua‘i” at the base of Wai‘ale‘ale to honor the mountain. “Maika‘i Kaua‘i” is a *mele* written by Caesar Kapa‘akea, the father of Kalākaua. The *mele* was written to honor Princess Bernice Pauahi Bishop’s adopted son, Keolaokalani. The *mele* is based on an *oli* that honors Kaumūali‘i, the last ruling *ali‘i* of Kaua‘i. The *mele* describes the cultural landscape of Kaua‘i and touches on Wai‘ale‘ale; the *mokihana* (*Pelea anisata*), a fragrant berry only found on Kaua‘i; and Nāmolokama, a *pu‘u* (peak) and waterfall in Hanalei. Ms. Cody added that *hula* shares a story of Hawai‘i that is rapidly fading due to anthropogenic changes, and with that some of the imagery and stories expressed in *hula* are slowly disappearing from our physical landscape. She continued, “But when you are able to understand the *mo‘olelo* told through *hula*, then the memory and integrity of a traditional environmental kinship is still preserved.”

Although there were two meetings on 20 July 2017 held in a formal and informal setting, she added that many important cultural practitioners were not present at either meeting because they are *kūpuna* and unable to travel or are caretakers of other places off island. She pointed out that Devin Kamealoha Forrest, who is *kama‘āina* to Kaua‘i, is currently conducting research off island on O‘ahu. Mr. Forrest’s research includes reviewing Hawaiian newspapers and books for references to Kaua‘i Island. Mr. Forrest has shared with Ms. Cody that in his research he has found

references to Kaua‘i are scarce. She explained that this void in research possibly illustrates that the people of Kaua‘i still used oral traditions, which unfortunately have been lost over the years. Ms. Cody stated that many of those present at the *mauka huaka‘i*, which took place after the meeting at the Kaua‘i County rotunda, are the front runners today who are attempting to fight for Native land rights and preserve their culture. Although their approach does seem radical, this group actively takes a stand on communal issues that affect the island. Many *kama‘āina* and practitioners are losing access to areas where they gather, fish, or hunt. In addition, many are being displaced from their own homes and homelands due to a rise in cost of living. Ms. Cody referred CSH to speak with Ka‘imi Hermosura, a *kama‘āina* of Wainiha Ahupua‘a who has learned traditional subsistence practices from his *‘ohana* over the years. His *kuleana* also includes being a caretaker of several *heiau*. She described Mr. Hermosura as having a special connection to our *kūpuna* and that he sees the world through a different lens. The two have known each other for over a decade and have worked together on Kaho‘olawe through the Protect Kaho‘olawe ‘Ohana (PKO) organization, a grassroots group that is working to restore the island’s natural and cultural resources from military exercises that occurred between 1941 to 1993. Mr. Hermosura grew up with the understanding to not share information passed down by his *kūpuna*. Today, Mr. Hermosura shares that knowledge with others. Ms. Cody added that Generation X and Millenials are coming from a standpoint where traditional knowledge needs to be shared and exercised. Aunty Nani Rogers, who attended the meeting at the Kaua‘i County rotunda, said to Ms. Cody, “You are the Makua [parent] generation. Now you need to Kua [to carry].”

She stressed that it’s important for Native Hawaiians to stick together, to keep traditions alive, and to deal with external threats. She recommended CSH facilitate discussions with Devin Kamealoha Forrest and Ka‘imi Hermosura.

7.2 Sabra Kauka and Danny Hashimoto

CSH met with Sabra Kauka and Danny Hashimoto on 5 November 2018 at Papaya’s in Kapa‘a to discuss the CIA on the Blue Hole Diversion.

Sabra Kauka is currently a *kumu* (teacher) of Hawaiian Studies at Island School in Līhu‘e, Kaua‘i. Ms. Kauka’s father was in the Army and she traveled the world at a young age. She lived in Germany, San Francisco, Vietnam, and Maryland before moving to Hawai‘i. Her family has always loved the outdoors—whether it was snow activities in the Alps or camping in the Sierras. When she moved back home to Hawai‘i she retreated to the mountains where she would hike with her uncle or she canoed or surfed at the beach. Ms. Kauka pursued a degree in anthropology and graduated from the University of Hawai‘i (UH) at Mānoa. She chose anthropology because she was interested in different cultures and people. Upon graduating from UH, she left Hawai‘i and moved to Alaska to raise her family. During her time in Alaska she by chance became a photojournalist after a friend asked her to write a story for a magazine. Her connection back to Hawai‘i was through an article in the Associated Press on a Native Hawaiian Studies Commission report, which discussed the downfall of Native Hawaiians. The article resonated with Ms. Kauka and she eventually made her way back home to Hawai‘i in the late 1980s. When she made the transition home, photojournalism was no longer in the cards. After freelancing a bit, she became the first public information officer for former Mayor of Kaua‘i, Joanne Yukimura. While she was working for the Mayor, she met a group of Hawaiian Studies teachers who were singing Christmas carols. She became acquainted with Wilma Place, who dropped off material for Ms. Kauka to read

on a regular basis. She eventually left the Mayor’s office and transitioned over to become a Hawaiian Studies teacher.

Danny Hashimoto owns and operates KauaiQuest Adventures, an outdoor recreation company based on Kaua‘i. Mr. Hashimoto is of Japanese, Chinese, and Native Hawaiian descent. In 2006, Mr. Hashimoto began KauaiQuest where he leads hiking tours, kayak excursions, and shares his knowledge of *wahi pana*, native plants, animals, and the history of the Hawaiian Islands. He also brings homemade “superfood chocolate treats” on his tours to share with his guests, which are made with raw cacao.

During the interview, Mr. Hashimoto shared photos of his hikes in the upper reaches of Wailua Ahupua‘a. Photos indicate plants in the area are not growing as they should. Ms. Kauka states that lack of growth, water, and changes in color (yellow and spotting) are indicators that the plant’s health is being jeopardized. Mr. Hashimoto points out that stamens are not formed and there is a clear lack of nutrients signifying an issue with the environment.

Ms. Kauka stated, “I don’t know of anybody else who has ventured as far or as often or as consistently as Danny has into Wai‘ale‘ale, into the piko [navel] there.” It is clear Mr. Hashimoto knows the landscape of Wailua, pointing out two swimming holes and the Kuilau Trail head at the Keahua Arboretum. The area consists of some rainbow eucalyptus trees. However, Ms. Kauka begged to differ on her stance with non-native plants:

> What I see in that whole area is a tremendous number of invasives and it’s like . . . you want to restore this area it’s not just a matter of returning water to the flow, you have a huge challenge to remove the invasives. Whether you want to grow taro or whatever you want to grow, you’ve got to remove those invasives first and keep them out. And there are far better areas to grow taro than up there, to me.
>
> When David Boynton took us up there we were looking at all the plants in there . . .it was pretty obvious to us that there had been a habitation there. We didn’t look extensively to find any house sites, but the plants alone told us. It may have been the guys who worked up there that may have put plants up there in the ground they knew they could use but there are a lot of canoe kind of plants up there and food plants . . . yeah, I think there was some *mai‘a*, some banana. I believe there was some *‘ohe* [bamboo]. Some Hawaiian *‘ohe*. Ti, *‘ohe*, *mai‘a*, yeah.

Mr. Hashimoto confirmed the bananas are still plentiful and he cuts them down when he is hiking with a group. He added that there is also guava and *māmaki* (*Pipturus* spp.).

The conversation then shifted to viable areas for growing taro. Ms. Kauka stated that the taro growing areas were closer *makai* and that flooding does occur in the upper reaches of Wailua Ahupua‘a, which emanates from Wai‘ale‘ale and Blue Hole. She suspects some families lived in the *mauka* region of Wailua but were scattered throughout. She pointed out there were more areas that were easier to access, farm in, had access to fish, and to trade.

Mr. Hashimoto recalled a *heiau* along a ridge but did not specify which ridge.

In terms of marked trails besides the Kuilau Trail, the Powerline Trail is approximately 13 miles each way. Mr. Hashimoto has hiked the Powerline Trail:

> . . . I knew I would not enjoy walking under the power lines. That’s not my thing. It’s intriguing to know that people can get to the other side of the island, call it a shortcut if you want. It’s a long, arduous hike. Shortcuts can get you into trouble.

Another trail is Makaleha, which Mr. Hashimoto described as a mini Wai‘ale‘ale: “You go up there, the terrain is rugged. You’re rock hopping, stream crossing, the jungle is thick and some people do get lost up there, but if you just listen for the stream and stay close to it, you’ll be okay.” He shared that there are a lot of invasive species on the Makaleha hike such as ginger. Ms. Kauka added,

> In ancient times there was an old trail that connected Makaleha to Wai‘ale‘ale cause that’s the route that they would take if they had war canoes land in Wailua and they had the chiefesses on top of Nounou. They took her up Makaleha, Wai‘ale‘ale, to above Hanapēpē. Above Maunawaiapuna. There is a site or a habitation site of Maunawaiapuna at the back of Hanapēpē Valley.

She also mentioned a spring prior to Makaleha. Mr. Hashimoto continued,

> There is the gusher springs which is the pipe that takes you 6-7 minutes to get to, you don’t even have to cross the stream, but then if you start the hike and you go upstream through the jungle and the bamboo forest and dipping pools along the way. Amazing dipping pools and small waterfalls, um, and then about 35-40 minutes into the hike there is sacred springs. It’s off to the trail, most people miss it. But if you know, of course if you’re already an experienced Makaleha hiker then we always do that and I tell people pour out all their water cause you’re going to love this water and then we do our own little ceremony as I mentioned earlier and then just drink and I like splashing it over myself . . .

Mr. Hashimoto then contrasted the difference between Makaleha and Wai‘ale‘ale:

> You got high waterfalls coming down. They are intermittent sometimes. It will rain one day and those waterfalls will be flowing and two days later it will be difficult to see but it’s always spectacular right after a rain . . . I like going up there any time but after a rain if you’re into photographing waterfalls and then you have more waterfalls to play in. That’s part of the reason we do the Makaleha hike. This is different from Wai‘ale‘ale cause Wai‘ale‘ale you have such a huge bowl and it takes so much time to get to the Weeping Wall, to our head waters, that most of our time is spent hiking with only 10 minutes for dipping, whereas in Makaleha we can spend an hour and a half to two hours dipping, finding the waterfalls, enjoying multiple locations and getting fully immersed and of course drinking. Cause Wai‘ale‘ale is the same thing, you can drink all the spring water you want. So yeah, we have several beautiful hikes just here on the east side. Makaleha. And there is some evidence of some terracing up there, I think, as you go up. But small kine.

Ms. Kauka mentioned that the end of the road to Makaleha has changed since Hurricane Iniki occurred in 1992. The hurricane was the most powerful hurricane to strike the Hawaiian Islands. Iniki impacted the island of Kaua‘i the most, causing billions of dollars in damage and six deaths.

In terms of impacts and recommendations, Ms. Kauka stated the following:

> I guess one of my concerns is, if the objective is to increase the flow into this original river bed here, you have to remove the invasives that are clogging it . . . it’s not just a matter of dumping more water in there . . . but if they want to put the water in here and bring it down, you have got to remove the invasives that are sucking it up. It’s choke, it’s absolutely choked with invasive plants . . . and that’s a huge maintenance that the State hasn’t been willing to. They don’t have the funds, they don’t have the manpower, they don’t have the means to maintain it. You want to increase the flow of the water, you have to remove the invasives that have come in there and are clogging it.

Mr. Hashimoto added,

> Just by opening this up fully, that could be possible. Major flash floods will create a stronger flow and umm, it will take out invasives, boulders. It will open up the stream. I have seen that happen in Makaleha. Albizia trees, mango trees are down. Boulders. We’ve had the swimming holes get totally filled for years, we went out to our favorite swimming hole and it clears out the boulders and now we have our swimming hole back again. It’s kinda cool but it shows how much power there is in the water itself.

Section 8 Traditional Cultural Practices

8.1 Political Epicenter

Wailua was not chronicled in western accounts as most voyagers landed in Waimea during the late eighteenth and early nineteenth centuries. However, Wailua was an important place for the *ali‘i*. Archaeological evidence and Hawai‘i history indicates Wailua was the religious and political epicenter of Kaua‘i during ancient times known as Wailuanuiho‘ānu or “great, sacred Wailua,” a place *kapu* to the *maka‘āinana* (Dickey 1916). *Mo‘olelo* associated with some of the most legendary and historical figures of Kaua‘i including Māui, Kawelo, Mō‘īkeha, and Palila suggest the ancient and continuous occupation of Wailua Ahupua‘a. *‘Ōlelo no‘eau* describe Holoholokū as the sacred birthplace for chiefs. King Kaumuali‘i was born at the Pōhaku Ho‘ohānau located on the north bank of the Wailua River. Holoholokū was located just inland from this area. The many *heiau* along the Wailua River indicate this area was very sacred to the Hawaiian population.

8.2 Cultivation, Fishing, and Gathering of Plant Resources

Early accounts discuss the abundance of food resources in Wailua. Lieutenant Charles Wilkes explains the procedure of fattening fish in Queen Debora Kapule’s fishponds. The fishponds on her property had different salinity levels. Young fish were transferred to salty ponds and as they grew larger, were transferred to less salty ponds until they were moved to fresh water (Wilkes 1845:4:68).

Wilkes also describes the banks along the Wailua River as covered in taro patches and sugar plantations. Patches of breadfruit, sugarcane, and oranges were also observed along the river banks (Wilkes 1845:4:68–69).

In a previous personal narrative, Jeffrey Agader recalled fishing in the mountain streams behind Kālepa. Mr. Agader also fished for blue gill in a small reservoir behind Kālepa Ridge. Worms or bread were used as bait. Mr. Agader’s mother would fry the fish to a crisp, so the bones could be eaten as well. Mr. Agader would lay net at night to catch *‘ōpae* in Hanamā‘ulu River. Mr. Agader would lay more than a dozen round nets attached to a long wooden pole about 25 yards apart from each other. Bait used to catch *‘ōpae* was a paste-like mixture of water, flour, and middling placed on a heavy stone in the center of each net. Mr. Agader’s father ate the *‘ōpae* raw with some lemon juice. Mr. Agader ate the *‘ōpae* fried. During one fishing trip to a stream below Wailua Falls, Mr. Agader’s father brought along salt, tomatoes, and rice and cooked what was caught. Mr. Agader recalled catching mullet in the fresh water ponds above Wailua. Mr. Agader recalled plantation life in Hanamā‘ulu, describing it as “OK for us kids.” Mr. Agader’s family had a garden that provided almost everything they needed for sustenance. The Agaders’ garden consisted of eggplants, lima beans, bittermelon, long beans, maronggay, katuday, pumpkin, squash, sweet potato, tomato, head cabbage, won bok, lettuce, bell pepper, green onion, broccoli, and chili pepper. Mr. Agader recalled the store in Hanamā‘ulu only selling round onions, potatoes, and carrots. In addition to the general store, a Japanese man peddled his vegetables from a truck once a week through the plantation (Agader 2004).

A number of respondents (including Josephine Bonaparte, Kamealoha Hanohano-Smith, Hope Kallai, Michael Leibbrandt, Noa Mau-Espirito, Kanoa Mayer, Sharon of Hui Ho‘opulapula Na

Wai o Puna, Felicia Alongi Cowden, John Ka‘ohelauli‘i, Dr. Mehana Vaughan, and Koa Young) were concerned with diminishing water for *kalo* farmers; fresh water aquaculture habitats (including *hīhīwai* [endemic grainy snail; *Neritinu granosa*] *‘ōpae*, *pinao* [flying gurnard; *Dactylopterus oreintalis*], *‘ama‘ama* [mullet], frogs, barracuda, *pāpio* [juvenile crevalle], Samoan crab, and various varieties of *‘o‘opu*); vegetation such as the *wī* (*Spondias dulcis*), *hau* (beach hibiscus; *Hibiscus tiliaceus*), *pili* (*Heteropogon contortus*), *lei* materials, and rice reeds; and spawning that occurs at the opening of the river mouth as it drains into the ocean, which is important in circulating nutrients into the sea. Another respondent was concerned about the population of a rare bamboo found in the upper stretches of Wailua Ahupua‘a, which he uses in the art of *‘ohe hano ihu* (Hawaiian nose flute). One respondent was also concerned about the *pepeiao* (edible tree fungus) population, which grows on the *hau* bushes. Another participant pointed out that the week CSH visited Kaua‘i, a *papa ku‘i ‘ai* (*poi* pounding board) workshop was being conducted. During the workshop, approximately 140 9-ft boards were cut and made, evience of an active culture attempting to thrive.

Nicole Hoku Cody, who has done extensive work at Papahānaumokuākea Marine National Monument for JIMAR, NMFS, NOAA, FWS, and DOFAW, has conducted interviews with local Kaua‘i fishermen to better understand the Kaua‘i food market and sustainability with the longlining industry. She met most participants at the mouth of the Wailua River. Her observations included fishermen not wanting to clean their fish in rivers, marshes, and brackish water downstream of activities that had negative environmental impacts such as pesticide spraying, illegal dumping, etc.

Danny Hashimoto shared photos of his hikes in the upper reaches of Wailua Ahupua‘a, which included the flora of the area. Photos indicated that plants in the area are not growing. Sabra Kauka stated that lack of growth, water, and changes in color (e.g., yellow leaves and spotting) are indicators that plant health is being compromised. Mr. Hashimoto added that plant stamens are not forming correctly and there is a clear lack of nutrients signifying issues with the environment. Ms. Kauka pointed out there are a number of invasive species in the Wailua Mauka area, especially *Albizia*, which displaces native plants by blocking sunlight with its extensive canopy and absorbing massive amounts of water, essentially starving other plants.

Ms. Kauka shared that when she toured the area with her friend, David Boynton, it was obvious that there was once habitation in the upper reaches of Wailua Ahupua‘a. She continued, “We didn’t look extensively to find any house sites, but the plants alone told us.” She added that people may have purposely planted them, but there were many canoe and food plants including bamboo, banana, and ti.

8.3 *‘Āina*-Based Learning

Kamealoha Hanohano-Smith pointed out that approximately 50-60 years ago, Hawaiian-focused charter schools and organizations (such as Kaiāulu Papaloa) who utilize *‘āina*-based learning practices did not exist. Mr. Hanohano-Smith pointed out that

> these kula, papahana, a halau all focus on teaching traditional ecological knowledge, methodologies, language, culture, and native science: all skills needed to be traditional practitioners for spiritual and cultural practices, and also support

> practitioners who work in agriculture, aquaculture, renewable energy, sustainability, all industries that support our island economy.

Mr. Hanohano-Smith questions what future job prospects will encounter if there is no water, and questions the integrity of their community if there is no land or ocean areas suitable for cultural and/or spiritual practices.

Felicia Alongi Cowden, radio station host and educator at Akamai Learning, shared that she spends several weeks teaching her students about the history of Wailua. This includes learning about the diversion and a *huaka‘i* to the diversion. She pointed out that nearby villages once had waterways that flowed through them. Today areas where those villages once stood are dry. She added that there is evidence of early cultivation throughout the Wailua watershed, however, less cultural practice is occurring in these areas due to the restrictive measures.

Dr. Mehana Vaughan feels that although many visitors can access the upper *mauka* regions, many residents are unable to. She believes the “area needs and provides an opportunity to develop models which offer access with kuleana.” She gave examples of groups being granted access for educational and cultural activities in exchange for restoring native plants, mainteanance of ditches or roads, place name and *mo‘olelo* research, or the creation of curriculum about Wai‘ale‘ale for island schools.

8.4 Burials and Spirituality

Kalauokamanu Heiau, the large walled *heiau* located in Hanamā‘ulu that was of *po‘okanaka* class (Site 103; Bennett 1931:125) was partially destroyed to make room for the sugar mill of the Lihue Plantation. According to Wichman (1998:61–62), the *heiau* was greatly feared because many human sacrifices had been made there and the stench was so bad that travelers would hurry past while holding their noses.

Dickey (1917:15) relates that in Wailua Ahupua‘a, *makai* of the Pōhaku Piko near the river was a rock called “Pa Aikanaka.” This *pōhaku* was associated with nearby Holoholokū Heiau. According to Dickey, bodies were placed here after being sacrificed at Holoholokū.

The other major *heiau* in the area, according to Wichman (1998:72–73), was Kaleiomanu. This was also a sacrificial *heiau* and the large, flat rocks in the southwest corner were the sacrificial altar. The remains of the offerings were taken from the altar to the opening of Pu‘u Kī and buried. These sacrificial stones would appear to be what Dickey refers to as the “Pa Aikanaka.”

Debbie Jackson, *kalo* farmer who resides on *kuleana* land in Hā‘iku, stated that

> I begin by telling you that the mana ikaika of Waialeale is a force to be reckoned with. The heiau dedicated to IO right in front by the triangle is a testament to its worth. There is no other heiau like this in all these islands. My family, my ancestors know this and have ultimate respect for this. It hurts my naau to have to reveal this ike to you. You are forcing my naau to hurt. The water from Waialeale is sacred. There are sacred chants and oli describing the sacredness.

She continued on, stating that she comes from a line of *kahuna* who have passed down this *‘ike* to her. Koa Young shared that *kupa ‘āina* (island people, older timers) shared with him that the water from Wai‘ale‘ale is special due to its purity. Aunty Nani Rogers shared at a community meeting

that she is very culturally connected to the water that emanates from Wai‘ale‘ale and uses it for ceremonial purposes.

Nicole Hoku Cody stated that many that attended the *mauka huaka‘i* on 20 July 2017 are front runners who are attempting to fight for Native land rights and preserve their culture. One individual she referred to CSH was Ka‘imi Hermosura, a *kama‘āina* of Wainiha Ahupua‘a, who has learned traditional subsistence practices from his *‘ohana* over the years. His *kuleana* includes being a caretaker of several *heiau*.

Kamealoha Hanohano-Smith shared that his cultural practices include *kilo*, *kalo* (farming), and *ho‘omana*. All spiritual practices Mr. Hanohano-Smith engages in requires *wai* (water) from Wailua River and other streams from around the island.

Mr. Danny Hashimoto recalled a *heiau* along a ridge, but did not specify which ridge it could be found on.

8.5 Ka‘ao, Mo‘olelo, Oli, and *Mele*

Cultural heroes and *ali‘i* of Kaua‘i who once lived in Hanamā‘ulu and Wailua Ahupua‘a include Kawelo, Palila, Mō‘īkeha, and Kaumuali‘i. Many battles ensued between Kawelo and ‘Aikanaka (man-eater). Kawelo learned of ‘Aikanaka mistreating his parents and traveled straight to Wailua to go to war with the man-eater. ‘Aikanaka employed his warriors from Nounou Ridge and his lead warrior, Kauahoa, who were beaten by Kawelo.

The warrior Palila hailed from Kaua‘i. Kamahualele Ridge separates the two northern branches of the Wailua River. This place is called Kaelialina-a-ka-mahu where Palila was tattooed (Dickey 1917:29).

The ruling *ali‘i* Kaumuali‘i is said to have resided in Wailua. Historic references place his residence at Papa‘ena‘ena. However, Smith (1955:20) places him on the north bank of the Wailua River in an area known as Wailua Nui a Ho‘āno.

The many *heiau* of Wailua are said to have been constructed by the Menehune. Hauola, the city of refuge located at the mouth of the Wailua River, is said to have been constructed by Menehune who were directed by the chief Ola (Rice 1923:56). Poli‘ahu Heiau and Malae Heiau are both said to have been constructed by Menehune.

At a group community consultation, Sharon of Hui Ho‘opulapula Na Wai o Puna shared her experience of visiting the Blue Hole Diversion on 25 February 2017. She described the stream as being 100% diverted. Before leaving the diversion, Sharon and other attendees danced to “Maika‘i Kaua‘i,” a *mele* based on an *oli* that honors Kaumūali‘i, the last rulling *ali‘i* of Kaua‘i. The *mele* describes the cultural landscape of Kaua‘i and touches on Wai‘ale‘ale. Hope Kallai shared her memories of Kumu Hula Nathan Kalama writing a *mele* after Hurricane ‘Iniki. After the hurricane, Uncle Nathan was sitting at Lydgate Park and was in the process of writing the *mele*. He was listening to the sticks and trees that were coming down the river. As he was listening, he could tell what types of trees were getting washed down the river and emptied into the ocean. The dance is a *kāla‘au* or stick dance about the sound of the sticks. After each *hō‘ike*, Ms. Kallai takes all her *lei* and travels *mauka* to give an offering. She places her *lei* in the water hoping that it will end in Wailua, where the *mele* was written and the place it honors. However, due to the diversion, the water takes the *lei* toward Hanamā‘ulu instead of where it’s meant to go—through Wailua

Ahupua‘a. Dr. Mehana Vaughan, who previously toured the area with Kehau Kekua, danced to “Kaulilua,” a *mele* composed “to honor the dignity of” Kawaikini. Dr. Vaughan commented that “as hula practitioners and Hawaiians we dance and chante for places, and call their names. To be able to do so in those places, and to watch their response, is so important, providing more depth and understanding to our practice” which she believes gives more *mana* to these places. Nicole Hoku Cody, who was present at the group community consultation, adds that *hula* shares a story of Hawai‘i that is rapidly fading due to anthropogenic changes. With change, some of the imagery and stories expressed in *hula* are being wiped from the physical landscape, “but when you are able to understand the *mo‘olelo* told through *hula*, then the memory and integrity of a traditional environmental kinship is still preserved.”

8.6 Trails and *Wahi Pana*

Mr. Danny Hashimoto owns and operates KauaiQuest Adventures, an outdoor recreation company that specializes in hiking tours and kayak excursions. Mr. Hashimoto pointed out two swimming holes and the Kuilau Trail head located at the Keahua Arboretum. He also shared his knowledge of the Powerline Trail and Makaleha.

Ms. Kauka shared the following:

> In ancient times there was an old trail that connected Makaleha to Wai‘ale‘ale cause that’s the route that they would take if they had war canoes land in Wailua and they had the chiefesses on top of Nounou. They took her up to Makaleha, Wai‘ale‘ale, to above Hanapēpē. Above Maunawaiapuna. There is a site or a habitation site of Maunawaiapuna at the back of Hanapēpē Valley.

Other trails are found on the USGS topographic maps and at least some of the four wheel drive roads may have originally been foot paths.

Section 9 Summary and Recommendations

CSH undertook this CIA at the request of KIUC. The research broadly covered the entire *ahupua‘a* of Hanamā‘ulu and Wailua, including the Blue Hole Diversion project area.

9.1 Results of Background Research

Background research for this study yielded the following results, presented in approximate chronological order:

1. Hanamā‘ulu and Wailua Ahupua‘a comprise a large system of freshwater resources. According to Wichman, Wai‘ale‘ale is the main source for several streams including Wai‘ahi and Wai‘aka (Wichman 1998:60). These streams eventually feed into Kapaia Reservoir and Hanamā‘ulu Stream, which empties into Hanamā‘ulu Bay.
2. The most popular and literal translation of Wailua is “two waters” (Pukui et al. 1974:224), supposedly referring to the two main forks (north and south) that comprise the Wailua River. Lyle Dickey writes, “this explanation never seems to occur to a native Hawaiian” (1917:15). Another meaning is “water pit,” referring to the pools at the bottom of several waterfalls along the river’s course (Damon 1931:360). According to Pukui and Elbert (1986:379), the term “wailua” means “spirit, ghost; remains of the dead,” and also refers to “an ancient variety of sweet potato presumably introduced from Wailua, Kaua‘i.”

   Kamakau (1976:7) attributes the name of Wailua Ahupua‘a as most likely derived from the fourteenth century high chief Wailuanuiaho‘āno, born in ‘Ewa, O‘ahu, and whose descendants went to Kaua‘i and to Maui, calling the land where they settled after the name of their ancestor. “Wailua was a song of La‘akona, ancestor of the ‘Ewa family by Ka-ho‘ano-o-Kalani. His name, Wailuanui-a-Ho‘ano, came from adding the name of his mother” (Kamakau 1976:7).

   The main source that feeds the river is Mount Wai‘ale‘ale. The *mauka* waterfalls, Kapakanui and Kapakaiki, literally refer to “big” and “little raindrop” (Pukui et al. 1974:187). Streams of the North Fork of Wailua River include Kawi, Uhau ‘iole, and Keāhua. Streams of the South Fork of the river include ‘Ili‘ili‘ula and Hāli‘i.

   Ōpaeka‘a (“rolling shrimp”; Pukui et al. 1974:171) Stream is also a tributary of the Wailua River but enters the Wailua River in the ocean-tidal influenced section approximately 0.6 miles from the river mouth. It does not contribute any water to taro growing areas in the watershed of the Wailua River. Instead water diverted from Ōpaeka‘a Stream contributes to taro growing areas to the north of the Wailua watershed including the formerly extensive swampy areas north through Olohena into Kapa‘a along with Konohiki Stream and other smaller unnamed streams; the former swamp is now drained by manmade Moikeha, Waikaea, and Waipouli canals.
3. Hanamā‘ulu is home to Kalauokamanu Heiau which was a large walled *heiau* of *po‘okanaka*, sacrificial, class (Bennett 1931:125). In 1855, a large section of a wall was destroyed to make room for the sugar mill of the Lihue Plantation.
4. The *makai* portion of Wailua Ahupua‘a, known as Wailua Nui Hoanu or Wailua Nui Lani, was the political epicenter of Kaua‘i during ancient times. At least seven major *heiau* have

been recorded in a relatively small portion of Wailua Ahupua‘a including Pōhaku‘ele‘ele Heiau, Hikinaakalā Heiau, Holoholokū Heiau, Pōhaku Ho‘ohānau, Malae Heiau, Poli‘ahu Heiau, and the Pōhaku kani Bellstone. The complex of *heiau* was declared a National Historic Landmark in 1962.

5. According to some *kama‘āina* of the area, Wailua was known as a *pu‘uhonua* or place of refuge (Smith 1955:15). *Pu‘uhonua* were places of peace and safety for transgressors and non-combatants in times of strife. Holoholokū Heiau is identified as such by historian John Papa ‘Ī‘ī (1959:138); Hikinaakalā Heiau by historian and author Frederick Wichman (1985:70). Judge Lyle A. Dickey (1917:15) maintains that Hauola was a *pu‘uhonua*.
6. The *ahupua‘a* of Hanamā‘ulu was purchased by Paul Isenberg, the manager of Lihue Plantation (Damon 1931:742–747). By 1870, the plantation owned 17,000 acres of undeveloped land in Hanamā‘ulu. Albert Spencer Wilcox started the first sugarcane plantation in Hanamā‘ulu called the Hanamaulu Plantation (Dorrance and Morgan 2000:28). A mill was erected in 1877, and a railroad was constructed to connect the fields to the mill. In 1898, Hanamaulu Plantation merged into Lihue Plantation. Hanamaulu Mill operated until 1920 and was later converted into housing for workers.
7. A personal narrative written by Jeffrey Agader (2004), who grew up in Hanamā‘ulu during the 1950s, depicts the cultural and historical background of the *ahupua‘a* with nuanced recollections.
8. The Lihue Plantation Company used gravity flow irrigation for its sugar growing operation. On closing, the irrigation system contained over 30 miles of ditches and tunnels,and many reservoirs, collecting water from streams across the Wailua, Hanamā‘ulu, and Kapa‘a watersheds. In 1998, with the collapse of the sugar industry, plantation irrigation systems were abandoned and left to deteriorate (Department of Agriculture 2003:12). Today, private businesses and farmers are advocating for the Department of Agriculture to take over management of the irrigation system as the life blood of a new diversified agriculture industry takes the place of the sugar plantations (Department of Agriculture 2003:12).
9. The state is working on balancing the economic needs for the stream waters and the life and health of the stream with ongoing cultural practices including, but not limited to, maintaining traditional ponded fields for taro farming, pig hunting, forest plant collection, and ceremonial use of stream and forest locales.

9.2 Results of Community Consultation

9.2.1 Testimony collected through interviews

CSH attempted to contact NHOs, agencies, and community members. Consultation, referrals, or personal testimony was received from the following community members:

1. Ted Blake, *kama‘āina*
2. Josephine Bonaparet, *kama‘āina*
3. Nicole Hoku Cody, *kama‘āina* and marine biologist
4. Felicia Alongi Cowden, radio host and educator
5. Kyle Gilmore, *kama‘āina*
6. Kamealoha Hanohano-Smith, *kama‘āina,* cultural practitioner and Wailua Representative for the ‘Aha Moku Council

7. Debbie Jackson, *kalo* (taro; *Colocasia esculenta*) farmer and *kama‘āina* on *kuelana* (Native land rights) lands
8. Hope Kallai, cultural practitioner
9. John Ka‘ohelauli‘i, *kama‘āina* and cultural practitioner
10. Michael Leibbrandt, *kama‘āina*
11. Noa Mau-Espirito, *kama‘āina*, cultural practitioner, occupying the former Coco Palms Hotel
12. Kanoa Mayer, resident of Olohena
13. Beverly Muraoka, *kumu hula* (*hula* teacher), cultural practitioner, and former entertainer at Coco Palms Hotel
14. Katherine Muzik, teacher and researcher of coral and *limu* (general name for seaweed)
15. Puanani Rogers, Ho‘okipa Network, *kama‘āina*, *kupuna*, and Coordinator for the ‘Aha Moku Council
16. Ka‘ahiki Solis, Cultural Historian at the SHPD
17. Dr. Mehana Vaughan, *kama‘āina* and Associate Professor in the Department of Natural Resources and Environmental Management at the University of Hawai‘i at Mānoa
18. Koa Young, *kama‘āina*
19. Danny Hashimoto, cultural practitioner and tour operator with KauaiQuest Adventures
20. Sabra Kauka, cultural practitioner and *kumu*

9.2.2 Testimony provided via written comment related to legislative actions

CSH reviewed a few of the documents related to legislative action to transfer management and maintenance of the plantation ditch water diversion system from the DLNR to the Department of Agriculture for the water needs of the diversified agriculture economy that has replaced the sugar plantations. Two examples of these actions are presented in the appendicies (Appendix D: Senate Bill No. 223 SD2 Relating to Irrigation and Appendix E: White Paper, East Kauai Water Users' Cooperative Related to Blue Hole Diversion and East Kauai Ag Lands Non-Cultural Community Concerns and Recommendations).

9.3 Non-Cultural Community Concerns and Recommendations

Based on information gathered from the community consultation and personal testimonies submitted, participants voiced the following concerns not related to the cultural context.

1. Josephine Bonaparte and Puanani Rogers both expressed that the 65-year lease was too long. Ms. Bonaparte suggested a month-to-month revocable lease.
2. Hope Kallai is concerned about the existing dam and ditch's structure. She pointed out that the existing structure has holes and exposed rebar, which is a threat to public safety.
3. Participants expressed the anticipation of reviewing the previous contractor's CIA findings. Participants felt there should be more dialogue between the project proponent and the community in regards to planning and mitigation.

9.4 Community Concerns and Recommendations

Based on information gathered from the community consultation and personal testimonies submitted, participants voiced the following concerns related to the cultural context.

1. Many community members shared their concern for low flow to no flow of water and how it affects water ecosystems *mauka* to *makai*; surrounding vegetation gathered for cultural practices including for *lei* (garland) making and *‘ohe hano ihu*; and traditional subsistence gathering (*lo‘i kalo*; fresh water and salt water fish; fresh water limpets; frogs; crabs; *pepeiao* that grows on *hau*).
    a. Dr. Mehana Vaughan believes the drying of the North Fork should be addressed immediately. She suggested removing the existing dam as soon as possible and devising a replacement system where the diversion leaves more than half of the water in the stream, not taking more than 50% of the daily flow. She suggested lava rock (uncemented) be used.
    b. Many cited a Native Hawaiian practice of not taking 100% of the water from a waterway. Community members voiced the same sentiment regarding the *lo‘i* system, where water enters the *lo‘i* then is placed back into the stream. Without water being rediverted, many organisms such as *‘ōpae*, *‘o‘opu*, *hīhīwai*, and other fresh and salt water aquaculture are unable to thrive or reproduce.
2. Several *kama‘āina* including Debbie Jackson, Kamealoha Hanohano-Smith, and Puanani Rogers expressed that the water from Wai‘ale‘ale is sacred and used for ceremonial practices.
3. Many pointed out that *oli*, *mele*, and *hula* describe the mass quantity and sacredness of the *wai*. Interviewee Nicole Hoku Cody expressed that *hula* shares a story of Hawai‘i that is rapidly fading due to anthropogenic changes. However, when you are able to understand the *mo‘olelo* told through *hula*, the memory and integrity of a traditional environment kinship is still preserved.
4. A number of participants discussed the General Plan; cited Native Tenant Rights, International Law, the 1839 Declaration of Rights, the 1839 Law Respecting Water for Irrigation Water Rights, the 1840 Constitution, the 1850 Kuleana Act, the 1978 Hawai‘i State Constitution (Article XI, Section 7), the Commission on Water Resources Management (CWRM); several lawsuits regarding water rights (McBryde vs. Robinson; Waiahole Decision); and the Department of Hawaiian Home Lands (DHHL) in regards to planning and future beneficiaries.
5. Ms. Sabra Kauka expressed her concern that if the objective is to increase water flow into the original river bed, nearby invasive species would need to be removed. Invasive species such as *Albizia* are a serious threat to native forests. *Albizia* displaces native plants by blocking sunlight with its extensive canopy and absorbing massive amounts of water, essentially starving other plants.
6. Mr. Danny Hashimoto echoed the same sentiments as Ms. Kauka. He suggested removing invasive species in the vicinity of the river bed to create a stronger flow of water. He also suggested removing boulders and other debris such as fallen trees (i.e., *Albizia* and mango) that disturb the flow.
7. Testimony on Senate Bill 223 SD2 in favor of the bill that “transfers operation authority over the portions of the East Kauai Irrigation System to the Department of Agriculture, establishes positions and makes appropriations.” The testimony includes comments from the Department of Agriculture, the East Kauai Water Users’ Cooperative, the Hawai‘i Farm Bureau, the Larry Jefts Farms, LLC, the Kalepa Kaolition, and the Saiva Siddhanta Church (refer to Appendix D Senate Bill No. 223 SD2 Relating to Irrigation).

8. The East Kauai Water Users' Cooperative related that discussions to date regarding the KIUC application to divert water at Blue Hole and Waikoko Streams for power production fail to encompass the impact on existing irrigation systems on State Kalepa lands downstream of the power houses. No proposal being put forth ensures the continued operation of this system servicing hundreds of acres of prime agricultural land, and supplying water to the adjacent DHHL lands. While Mr. Jerry Ornellas, President of the East Kauai Water Users' Cooperative, wrote in a 11 December 2018 letter to Board of Land and Natural Resources that

   > If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question-a key issue which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamaulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process. [Appendix E]

9.5 Impacts and Actions

Based on information gathered from the cultural and historical background, potential impacts were identified, and the following preliminary actions are suggested or are being taken:

1. <u>Impact</u>

   Participants expressed their concern for low to no flow and the negative effects on water ecosystems *mauka* to *makai*; surrounding vegetation gathered for cultural practices; traditional subsistence gathering; and ceremonial purposes.

   <u>Proposed Actions</u>

   Community members suggested restoring at least half (50%) of the water to North Fork; continued interactive consultation with the community (*kama‘āina*, *kūpuna*, cultural practitioners, farmers, and the KIUC) to achieve greater awareness of potential impacts on Hawaiian cultural beliefs, practices, and resources for long-term mitigation measures; biological and botanical data collection to determine appropriate release amounts for riparian flora and fauna health to balance with the needs of agriculture.

2. <u>Impact</u>

   Participants expressed their concern over invasive species near the river banks. *Albizia* and other invasive species are a serious threat to native forests by displacing native plants and depleting surrounding, essential resources (such as water and sunlight) vital to health and growth.

   <u>Proposed Action</u>

   Participants recommended that the proper entities and landowners:

   a. Develop a scheduled vegetation clearing plan (e.g., cut down large and/or invasive trees such as *Albizia* and *Miconia*; remove other invasive plants such as *Clidemia*

hirta) in the vicinity of and along the Wailua River bank to allow for maximum water and to prevent future blockages that may result in area flooding.

b. Develop a scheduled maintenance plan in the vicinity of and along the Wailua River bank to prevent future blockages that may result in area flooding (e.g., debris such as tree branches, boulders, leaves, trash).

3. Impact

Areas of taro farming are believed to be impacted due to water taken from the river at the diversion.

Action Taken

A pedestrian survey was conducted by CSH archaeologists along sections of the North Fork of Wailua River at and *makai* of the Blue Hole Diversion to check for potential taro growing areas (pre-Contact to present day). During the pedestrian survey, there was no evidence of terracing or relics of taro along the North Fork of the Wailua River. The river's gradient at the elevation of the diversion project area and to *mauka* and approximately 1/2 mile *makai* is steep with few flood terraces of minimal size in the valley bottom. This natural geography of the area is a major factor in determining that this location is not ideal or conducive to taro cultivation in terraced *lo‘i*. Māhele and previous archaeology documentation indicate habitation and associated taro cultivation was generally at and below approximately 800 ft elevation and close to the Wailua River mouth and ocean shoreline.

4. Impact

Although previous archaeological research did not indicate any burials or other historic properties other than the ditch within or near the project area, project construction workers and all other personnel involved in the construction, maintenance, or any other relative activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains.

Proposed Action

If *iwi kūpuna* (ancestral bones) are identified, all earth-moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended. If *iwi kūpuna* and/or cultural finds are encountered, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance. If any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3.

5. Impact

Diversified agriculture occurring in the former sugar plantation cane lands will be severely impacted if the existing ditch systems and reservoirs are not maintained. The KIUC hydroelectric plants will be severely impacted if the existing ditch systems and reservoirs

are not maintained. The cost of replacing the ditch water systems with another water delivery system is not cost effective.

Proposed Actions

Find a balance of water distribution for stream and riparian biota health, and agricultural irrigation and hydroelectric energy production needs by placing the existing ditch under state Department of Agriculture management and maintenance.

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Appendix A Letter from Kumu Beverly Muraoka

HEALANI'S HULA HALAU
Kapaa, Kauai

1111 Puuopae Rd. Kapaa, HI 96746 • 822-1451

September 11, 2017

Cultural Surveys Hawaii, Inc.
Attn: Nicole Ann N. Ishihara
399 Hualani St. Suite 124
Hilo, Hawaii 96720

Re. Job code: WAILUA 35
CIA for the KIUC Blue Hole Diversion Long Term Lease Project

Gentlemen:

I apologize for the late response in regards to subject. If it is too late, please know my comments are held deep in my beliefs, experiences and for the record, deeply rooted to my upbringing in respect to Wailua Ahupua'a.

I hold a "noe'au" dear to my heart learned from the late Kumu Kula, and La'au Lapa'au Kahuna, Levon Ohai--PARENTS WONDER WHY THE STREAM(s) ARE BITTER WHEN THEY HAVE POISONED THE FOUNTAIN--meaning what happens at the top affects the bottom and vice versa.

This sacred river has provided food for centuries to families living in Wailua and those that fish in it. It has provided economic success to those conducting tours and now more than ever, kayaks and water ski activities. Yes, the oil, gas, and wastewater have impacted this sacred gift from KeAkua and while I'm not privy to all of KIUC's activities we definitely need to ensure that the continued requests that it need to conduct hydroelectric activities be monitored with expertise and high technology formats to effectively provide those of us living "downstream" will not be left out on what was "our way of life long ago."

Our "Practices" include pepeiao from the hau bushes, crabs (usually Samoan), fishing of 'ama'ama(mullets) barracuda, papio, and frogs. The pili grass, hau itself, rice reeds, etc. make for all of the precious things used for our people living in Wailuanui-ahoano.

We trust this is helpful in resolving the impact that this will cause should the project be agreed between OHA(who knows very little) and KIUC.

Re. JOB Code: Wailua 35
CIA for the KIUC Blue Hole Diversion, et.al.

Page 02
September 11, 2017

It is my desire that Cultural Surveys contact some of the "old-timers" who, regretfully, are passing rapidly and taking their knowledge with them.

You must have contacted the Walter Smith, Jr. 'ohana, Valentine Ako , Kimo Fernandes and "ohana(Kamokila Village) and if not, these are suggested families you may want to interview. Mahalo nui loa.

Sincerely,

Beverly H.S.L.A. Muraoka
aka "Aunty Bev"

Beverly H. S. L. A. Muraoka
Kumu Hula, Retired

Appendix B Attachments from Hope Kallai

D-13

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division
Honolulu, Hawaii 96813

August 24, 2012

Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii Kauai

Withdrawal of Request for Contested Case Hearing by the Office of Hawaiian Affairs Regarding Agenda Item D-26, December 10, 2004 Meeting; Sale of 65-year Lease at Public Auction of Water Rights for the Use of the 'Blue Hole' Diversion and Portions of a Water Transmission System, Lihue-Koloa Forest Reserve (Wailua Section), Wailua, Lihue, Kauai, Tax Map Key No(s). (4) 3-9-001:001 & (4) 3-8-001:001 for Hydropower Generation, Non-Polluting and Non-Consumptive Use.

BACKGROUND

At the Board's meeting on December 10, 2004, under Agenda D-26, the Kauai Island Utility Cooperative ("KIUC") requested the Board to grant authorization for a sale of a water lease by public auction. A copy of the submittal is attached as Exhibit 1. The lease would provide for the use of water emanating from the "Blue Hole" diversion as well as a portion of an existing government-owned water transmission infrastructure system. KIUC sought to obtain a long term lease for hydropower generation through their Upper and Lower Lihue Hydropower Plants. Previously, KIUC had conducted these activities under Revocable Permit No. S-7340.

As the item was heard by the Board, requests for contested cases were received from the Office of Hawaiian Affairs ("OHA") and the Native Hawaiian Legal Corporation on behalf of Life of the Land. A copy of the Board minutes pertaining to this item is attached as Exhibit 2. As result, the Board ceased accepting testimony on the item and took no action regarding the item. No written petitions for contested case were found in Land Division files from either OHA or Life of the Land and no action has been taken by the Board to grant or deny the request for contested case.

Subsequently, OHA and KIUC entered into a memorandum of agreement whereby OHA agreed to withdraw their request for a contested case hearing if KIUC conducted specified studies in connection with the use of the surface water. KIUC has now completed the tasks necessary for OHA to withdraw its request for contested case hearing under the MOA. OHA and KIUC executed a stipulation memorializing the progress regarding their memorandum of agreement and OHA's withdrawal of their request for a contested case hearing. A copy of the stipulation excluding the exhibits is attached as Exhibit 3.

D–13

BLNR- Withdrawal of Request Contested Case Hearing Page 2 August 24, 2012

This matter is brought before the Board solely as an informational briefing, and the Board is not requested to take any action. Once the required studies as outlined in the stipulation are completed to the satisfaction of the parties, the matter will be brought before the Board in order to seek approval for an appropriate disposition.

Respectfully Submitted,

Ian C. Hirokawa
Project Development Specialist

APPROVED FOR SUBMITTAL;

William J. Aila, Jr., Chairperson

EXHIBIT 1

D-26

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division
Honolulu, Hawaii 96813

December 10, 2004

Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

PSF No.: 03KD-276

KAUAI

Sale of 65-year Lease at Public Auction of Water Rights for the Use of the "Blue Hole" Diversion and Portions of a Water Transmission System, Lihue-Koloa Forest Reserve (Wailua Section), Wailua, Lihue, Kauai, Tax Map Key No(s). (4) 3-9-1:01 & (4) 3-8-01:1 for Hydropower Generation, Non-Polluting and Non-Consumptive Use.

APPLICANT:

The law firm of Oshima Chun Fong & Chung, LLP, on behalf of Kauai Island Utility Cooperative ("KIUC"), a Hawaii non-profit corporation, whose business address is 4463 Pahee Street, Lihue, Hawaii 96766, .

LEGAL REFERENCE:

Section 171-58, Hawaii Revised Statutes ("HRS"), as amended.

LOCATION AND AREA:

Portion of Government lands and waters of Lihue-Koloa Forest Reserve (Wailua Section), Wailua, Lihue, Kauai, Hawaii, Tax Map Key 3-9-1:1, specifically identified as the Iliiliula North Wailua Ditch including the "Blue Hole" diversion, as shown on the attached map labeled Exhibit A.

Existing water transportation infrastructure system at the Blue Hole Diversion including a non-exclusive easement for access, maintenance and repair of the existing system.

ZONING:

State Land Use District: Conservation
County of Kauai CZO: None

EXHIBIT "1"

ITEM D-26

No action
~~APPROVED~~ BY THE BOARD OF
LAND AND NATURAL RESOURCES
AT ITS MEETING HELD ON
December 10, 2004

BLNR – Sale of Water Lease to KIUC Page 2 December 10, 2004

TRUST LAND STATUS:

Section 5(b) lands of the Hawaii Admission Act
DHHL 30% entitlement lands pursuant to the Hawaii State Constitution: YES

CURRENT USE STATUS:

On December 13, 2002, the Board of Land and Natural Resources ("Board") approved a revocable permit (Revocable Permit No. S-7340) for KIUC that allowed KIUC to use water from the Blue Hole Diversion and a portion of state-owned water transmission system for its Upper and Lower Lihue Hydropower plants. Revocable Permit No. S-7340 was renewed by the Board in December 2003 and is currently effective until December 31, 2004.

CHARACTER OF USE:

To divert, take, draw off, conduct away and dispose of government-owned water emanating from the "Blue Hole" diversion and the use, operation, repair and maintenance of a portion of an existing government-owned water transmission infrastructure system, including access roads for hydropower generation for KIUC's Upper and Lower Lihue Hydropower Plants, located on Tax Map Key No. 3-8-01:1 (4th Division).

The use of water from the "Blue Hole" diversion is a non-polluting and non-consumptive water use under section 171-58(c), HRS.

TERM OF LEASE:

65 years.

COMMENCEMENT DATE:

The first day of the month following the date of sale.

MINIMUM UPSET ANNUAL RENT:

To be determined by staff or independent appraisal establishing fair market rent, subject to review and approval by the Chairperson.

METHOD OF PAYMENT:

Semi-annual payments, in advance.

RENTAL REOPENINGS:

At the end of 20th and 40th years of the lease term, by staff or independent appraisal.

PERFORMANCE BOND:

Twice the annual rental amount.

CHAPTER 343—ENVIRONMENTAL ASSESSMENT:

Pursuant to section 11-200-8(a)(1), Hawaii Administrative Rules ("HAR") relating to Exempt Classes of Action of the Environmental Impact Statement Rules, the action is exempt from Chapter 343 compliance. Section 11-200-8(a)(1), HAR, exempts: "Operations, repairs, or maintenance of existing structures, facilities, equipment, or topographical features, involving negligible or no expansion or change of use beyond that previously existing."

DCCA VERIFICATION:

Place of business registration confirmed:	YES
Registered business name confirmed:	YES
Applicant in good standing confirmed:	YES

REMARKS:

HISTORY. General Lease No. S-3827 to the East Kauai Water Company was a 30-year lease allowing the lessee to divert, store, take, draw off, conduct away and dispose of government-owned water. The lease also allowed for the use, operation and maintenance of the aqueduct system. This lease expired in May 1995.

GL S-3827 in its original form covered an extensive water collection, delivery and distribution system including the drainage basins of Wailua, Kapaa, Anahola and Hanalei. In broad terms, the system was divided into three sections, the Anahola-Kealia section, the central Wailua-Kapaa section, and the Hanamaulu-Lihue section. All of the water provided by the East Kauai water system was used to irrigate sugar cane cultivated by Lihue Plantation Company. Over time, many portions of the system have fallen out of active use as sugar operations scaled down, then finally closed. For all intents and purposes, active and in-demand portions of the original East Kauai Water Company system under the control of the DLNR are now limited to the Wailua-Kapaa and Hanamaulu-Lihue sections. See Exhibit B, Map of the Water Transmission System.

Currently, the East Kauai Water Users Cooperative ("EKWUC"), (a duly formed and recognized State agricultural cooperative created for the purpose of operating private agricultural water systems on Kauai), was issued Revocable Permit No. S-7310, which is for the Wailua-Kapaa portion of the system plus the Kalepa portion of the Lihue-Hanamaulu section.

KIUC, the applicant for this action, is applying for a 65-year long-term lease for the use of the remainder portion of the existing Lihue-Hanamaulu section of the system. Specifically, the request is to obtain permission to purchase water and to use the diversion and portions of a transmission ditch (Iliiliula North Wailua ditch) including water collected from Waikoko Stream which combined are commonly known as the Blue Hole diversion, which is the most mauka diversion of the North Fork of the Wailua River and to use such access roads and areas needed for the operation, repair and maintenance of the system.

In December 2002, the Board approved a revocable permit to KIUC for the use of the Portion of Government lands and waters of Lihue-Koloa Forest Reserve (Wailua Section), Wailua, Lihue, Kauai, Hawaii, Tax Map Key 3-9-1:1, specifically identified as the Iliiliula North Wailua Ditch including the "Blue Hole" diversion, as shown on the attached map labeled Exhibit A and for existing water transportation infrastructure system at the Blue Hole Diversion including use for access, maintenance and repair of the existing system. The revocable permit was renewed in December 2003 and is currently effective until December 2004. KIUC is in compliance with all conditions under the revocable permit.

In April 2004, KIUC obtained Concurrent Resolution from the Legislature for this use of water at the Upper and Lower Lihue Hydroelectric Plants by lease. See Exhibit C, a copy of the 2004 Concurrent Resolution.

In June 2004 following up on earlier requests, KIUC requested that it be issued a 65-year long term lease for its non-consumptive use of water for hydropower purposes at its Upper and Lower Lihue plants.

KIUC'S INTEREST IN THE SYSTEM. KIUC is interested in using what has been historically a part of an agricultural irrigation system, to power two hydroelectric plants (800 KW and 500 KW nameplate capacity) obtained from AMFAC that were used to generate power for Lihue Plantation consumption and now are part of the KIUC electric grid. An important source of water needed to power the hydroelectric plants come from the Blue Hole diversion. The conveyance of these plants to KIUC by AMFAC was part of a settlement agreement concerning satisfaction by AMFAC of their power production contract with KIUC at the Lihue Mill. Because optimum operation of the hydroelectric plants depends upon continued access to water from the Blue Hole diversion, KIUC is the applicant for this long-term lease. KIUC's proposed use is a non-polluting and non-consumptive beneficial instream use as described in Hawaii Revised Statutes Sections 171-58(c) and 174C-3.

NEWCOMB'S SNAIL. The Newcomb's snail is listed as a threatened species under the Federal Endangered Species Act. When KIUC's revocable permit was being issued, the Aquatic Resources Division had raised concerns that the hydropower plants may adversely affected areas that may be designated as critical habitat of the Newcomb's snail. In its February 2004 report, the U.S. Fish and Wildlife Service has confirmed that the ditch system does not contain the constituent elements necessary for the snail and thus

excluded the same from the critical habitat boundaries. Based on the extensive review of this matter by the U.S. Fish and Wildlife Service, the agency charged with designating critical habitat of threatened and endangered species, it has been determined that the continuing use of the diversion will not adversely affect the Newcomb's snail.

DROUGHT CONDITIONS. The EKWUC raised the concern that during drought periods, KIUC's use of the water would deplete the water available to the EKWUC. It should be noted that KIUC's use is non-consumptive and would not affect the water going downstream to the EKWUC's portion of the ditch. However, in compliance with a condition in its revocable permit, KIUC did submit a drought plan for review by the Department of Land and Natural Resources on April 21, 2004. See Exhibit D, a copy of the proposed KIUC Drought Plan. Staff believes that this plan should address the concerns of the EKWUC during drought conditions.

CONTINUED USE OF LIHUE LAND COMPANY (LLC) PORTION OF HANAMAULU DITCH. After the water exits KIUC's two hydroelectric power plants, it travels through a portion of the Hanamaulu ditch system that is owned by the LLC to the State lands. The December 2002 board submittal authorized the Chairperson to enter into a water transmission agreement with LLC. The December submittal provided that any water transmission fees charged by LLC should be borne by the EKWUC. In the most recent discussions with LLC, Staff feels that an agreement can be worked out with LLC. Staff notes that the EKWUC was in agreement to bear the costs of the delivery of the water through the LLC portion of Hanamaulu ditch back to State lands in an August 2004 letter. See Exhibit E, August Letter from the EKWUC. Staff believes that some agreement with LLC will be done in the near future but does not believe that the processing of this long-term lease request should be delayed until an agreement can be worked out with LLC and the EKWUC. Staff confirms that KIUC's use of water is non-consumptive and should not affect the amount of water currently available to the EKWUC.

LEGAL REQUIREMENTS. For the issuance of a lease of water rights for non-consumptive use under section 171-58, HRS, the process involves board approval, prior approval by the Governor and Legislature by concurrent resolution, public auction and certain qualifications for applicants to bid at public auction. Under section 171-58(c), bidders must demonstrate that: (1) they met the requirements of chapters 343 and 183C, HRS, including any exemptions from those chapters, (2) water is used in non-polluting ways, and (3) the water use is non-consumptive, i.e. not affecting the volume or quality of the water or biota in the stream.

Section 171-58, HRS, also requires: (1) the Department to notify the Department of Hawaiian Home Lands of its intent to execute a new lease and to develop a reservation of water rights sufficient to support current and future homestead needs, (2) a covenant to provide surplus water at the same price as the lease plus proportionate share of actual costs for irrigated pasture, crop farming, pen feeding operations, or raising of grain and forage crops as determined by the Board, and (3) develop a watershed protection plan in conjunction with the Department on a watershed management plan for the lease area.

To avoid speculation and potential water banking of the state's water rights, the public auction will be limited to qualified bidders. Bidders must demonstrate that they have a legal right to access and use the Upper and Lower Lihue Hydropower plants, TMK Nos. 3-8-01:1 (4th Division) for hydropower purposes.

COMMENTS FROM DEPARTMENT OF HAWAIIAN HOME LANDS ("DHHL"): Comments from the DHHL are attached as Exhibit F and are summarized in relevant part below:

DHHL believes that this request is premature and recommends an extension of the revocable permit in the alternative, for the following reasons:

- A covenant to establish a watershed management plan or a watershed management plan has not been approved by the Board.

Comments: Contrary to DHHL's interpretation of Section 171-58(e), HRS, a covenant to establish a watershed management plan need only be included in the water lease. Section 171-58(e), HRS, states in pertinent part, "[a]ny new lease of water rights shall contain a covenant that requires the lessee and the department of land and natural resources to jointly develop and implement a watershed management plan. The board shall not approve any new lease of water rights without the foregoing covenant or a watershed management plan."

- DHHL needs more time to determine the amount of water to reserve to sufficiently support its current and future homestead needs.

Comments: DHHL's inability to provide precise amounts for its water reserve needs at this time should not delay the approval for this lease because we are recommending the amount of the reservation be left subject to subsequent determination by DHHL based on its newly devised Kauai Island Plan.

- The Department currently lacks a mechanism for establishing DHHL's reserved amount of water. The only mechanism for reserving water is set forth in Section 174C-49(d), HRS, and reserves that function to the Commission on Water Resource Management.

Comments: The authority of the Commission on Water Resource Management to establish water reserves under Section 174C-49(d), HRS, does not address the issue of reserving water rights in agreements. Water rights can be reserved between contracting parties by including a reservation of water reserve rights in the lease agreement. Further, staff believes the intent of the reservation is to ensure water is available for DHHL homesteads and is distinguishable from the Commission on Water Resource Management's authority to allocate water resources.

- Lessee has not met its burden to show that its use of the water will account for, protect, and not interfere with the reservation of water for DHHL, as a public trust use.

Comments: DHHL's assertion that its public trust use of the water resources is not being addressed is premature because the lease document is intended to deal with those issues through the watershed management plan and the reservation of water reserves for DHHL.

- Questions regarding the rights of LLC as a possible riparian landowner of the water system below the hydroelectric plants remain.

Comments: Staff is currently pursuing a water transmission agreement with LLC and EKWUC to address DHHL's concerns regarding LLC's obligation to provide water through the portions of the water system within its boundaries, after leaving the hydroelectric plants. Since the issues arising below the hydroelectric plants are outside of the control of any prospective lessee, staff believes that approval of this request should not be contingent upon the resolution of those issues.

- DHHL's Kauai Island Plan anticipates the development of the second largest DHHL community on the island over the next 20 years that includes 651 residential units, a 12-acre school/park, 50 units of kupuna housing and day-care center, and a regional commercial and social service center. DHHL is also planning to establish a district office and 99-acre agricultural community in the area. DHHL questions whether the water quality will be affected by the use of the water by the hydroelectric plants and indicates that a watershed management plan could address those concerns.

Comments: The nonconsumptive and nonpolluting nature of the water use by the hydroelectric plants should not affect the volume or quality of water available to downstream users. As acknowledged by DHHL, however, any water quality issues that may exist can be addressed in the watershed management plan that is contemplated by the lease.

- The appraised value of the water should be re-evaluated based on a change in use from consumptive agricultural use to industrial use.

Comments: The rent charged under the lease will be based on an appraisal that establishes fair market value by considering all of the appropriate factors concerning the nature and volume of the use of water.

PUBLIC BENEFIT. Staff believes that promoting the continued operation of hydroelectric power plants on Kauai will serve a critical public purpose by supporting clean alternative energy production that will contribute to meeting the State's renewable portfolio standards set forth in Section 269-92, HRS. Additionally, issuing the water lease will ensure the continuous operation of the hydropower plants in an efficient and cost effective manner by

enabling the plant operators to obtain funding for capital improvements that include the maintenance and repair of aging structures and equipment. Supporting the uninterrupted operation of the hydropower plants provides significant and tangible benefits to the general population of Kauai, as an important part of the power grid for that island.

RECOMMENDATION:

That the Board:

A. Declare that, after considering the potential effects of the proposed disposition as provided by Chapter 343, HRS, and Chapter 11-200, HAR, this project will probably have minimal or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment.

B. Find that, allowing the use of water from the Blue Hole diversion for purposes of continuing the operation of the Upper and Lower Hydropower plants that currently serve the general population of Kauai with electrical power, provides significant and tangible benefits to the public and is in the public interest.

C. Authorize the sale of a water lease by public auction for the use of water located on TMK No. 3-8-01:1 (4th Division) as shown on the attached map labeled Exhibit A, from the Blue Hole diversion, including a portion of the state owned ditch system and such roadways and access over state lands for the operation, maintenance, and repair of the system under the terms and conditions cited above, which are by this reference incorporated herein, and subject further to the following:

1. The standard terms and conditions of the most current applicable water lease form, as may be amended from time to time.

2. Reservation of water rights for Department of Hawaiian Home Lands sufficient to support current and future homesteaders in the lease area.

3. The lessee shall record and report monthly water use from the surface water diversions in accordance with Section 13-168-7 HAR.

4. The State reserves the right to withdraw water from the water lease to meet the following requirements as the State in its sole discretion may determine:

   Constitutionally protected water rights, in-stream flow standards, reservations needed to met the Department of Hawaiian Home Lands rights under Section 221 of the Hawaiian Homes Commission Act, as well as other statutorily or judicially recognized interests relating to the right to withdraw water for the purposes of and in accordance with the provisions of Section 171-58(d), Hawaii Revised Statutes.

5. A covenant that requires the lessee and the Department to jointly develop and implement a watershed management plan for the lease area, as prescribed by the

BLNR – Sale of Water Lease to KIUC Page 9 December 10, 2004

Board. At a minimum, the watershed management plan shall require the prevention of the degradation of surface and ground water quality to the extent that degradation can be avoided using reasonable management practices.

6. The amount of water diverted into the ditch system at Blue Hole on an annual basis shall not exceed the average annual amount diverted as measured for the period from 1992 to 2003.

7. Prior to any expansion or modification of any diversion works applicable to this project, lessee shall document all proposed modifications to the hydropower plant and diversion works and submit such documentation to the Commission on Water Resource Management to determine whether Commission approvals would be necessary.

8. Governor Approval obtained prior to the issuance of the lease.

9. Review and approval by the Department of the Attorney General.

10. Such other terms and conditions as may be prescribed by the Chairperson to best serve the interests of the State.

D. Declare that it is in the State's best interests to have its water returned to State land for irrigation purposes after its initial diversion for hydroelectric purposes, as previously existed when the prior lessee managed the system. In view of the fact that the return of the water to State lands principally benefits members of the EKWUC, the costs of the delivery of the water through the LLC portion of Hanamaulu ditch back to State lands shall be borne by the EKWUC members. All applicable delivery costs to the EKWUC members, by LLC, shall be for the upkeep of the delivery system, not for the water.

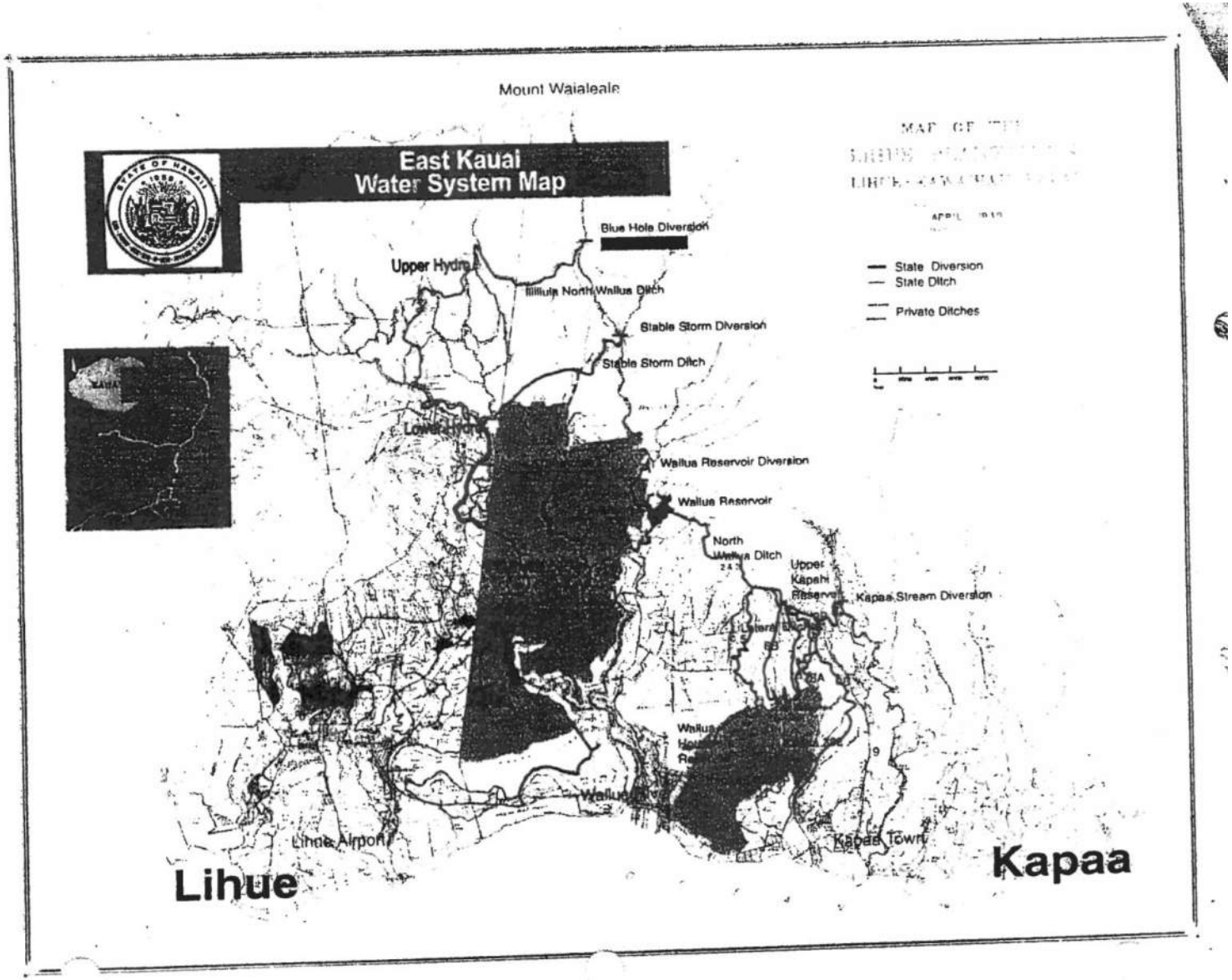
Respectfully Submitted,

Morris M. Atta
Special Projects Coordinator

APPROVED FOR SUBMITTAL:

for Peter T. Young, Chairperson

EXHIBIT A


Mount Waialeale
East Kauai
Water System Map
Blue Hole Diversion
Upper Hydro
Wailua North Wailua Ditch
Stable Storm Diversion
Stable Storm Ditch
Lower Hydro
Wailua Reservoir Diversion
Wailua Reservoir
North
Wailua Ditch
Upper
Kapahi
Reservoir
Kapaa Stream Diversion
Wailua
Wailua
Lihue Airport
Kapaa Town
Lihue
Kapaa
State Diversion
State Ditch
Private Ditches

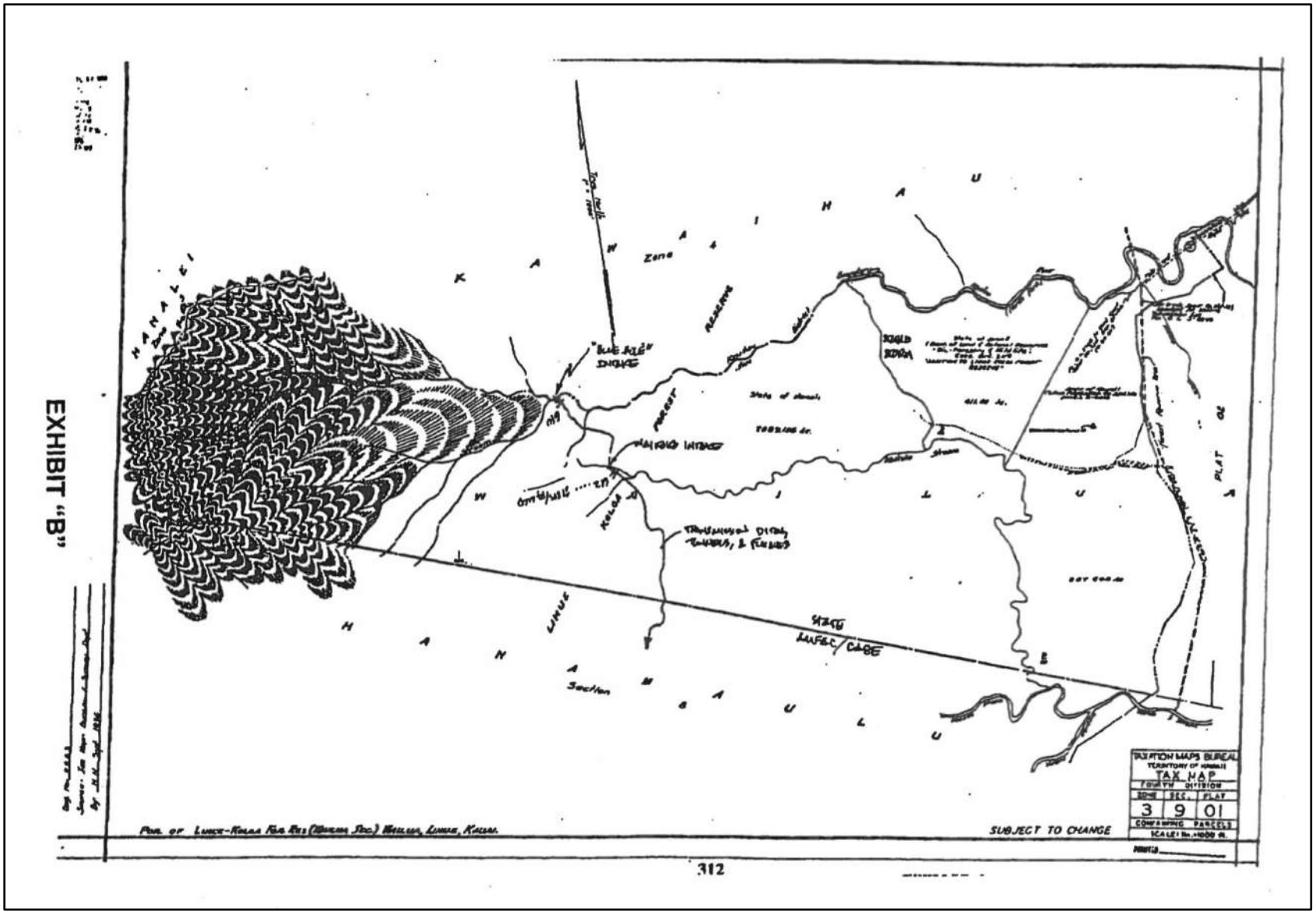


EXHIBIT "B"
"BLUE HOLE" DIKE
TAX MAP
3 9 01
SUBJECT TO CHANGE
312

HOUSE OF REPRESENTATIVES

STATE OF HAWAII
STATE CAPITOL
HONOLULU, HAWAII 96813

RECEIVED
'04 MAY 17 A10:41
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

May 11, 2004

Mr. Peter T. Young
Chair
Board of Land & Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Young:

I transmit herewith a copy of House Concurrent Resolution No. 124 HD1, which was adopted by the House of Representatives and the Senate of the Twenty-Second Legislature of the State of Hawaii, Regular Session of 2004.

Sincerely,

Patricia Mau-Shimizu
Chief Clerk
House of Representatives

RECEIVED
LAND DIVISION
2004 MAY 18 A 9:37
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

EXHIBIT C

HOUSE OF REPRESENTATIVES
TWENTY-SECOND LEGISLATURE, 2004
STATE OF HAWAII

H.C.R. NO. 124 H.D. 1

HOUSE CONCURRENT RESOLUTION

AUTHORIZING THE ISSUANCE OF A LEASE OF WATER RIGHTS FOR THE USE OF THE "BLUE HOLE" DIVERSION AND PORTIONS OF A WATER TRANSMISSION SYSTEM LOCATED IN THE WAILUA SECTION OF THE LIHUE-KOLOA FOREST RESERVE FOR HYDROPOWER PRODUCTION PURPOSES.

WHEREAS, General Lease No. S-3827 was a 30-year lease allowing the East Kauai Water Company to divert, store, take, draw off, conduct away, and dispose of government-owned water used by Lihue Plantation Company for agricultural irrigation and hydropower generation; and

WHEREAS, General Lease No. S-3827 covered an extensive water collection, delivery, and distribution system that was divided into three sections: Anahola-Kealia section, central Wailua-Kapaa section, and Hanamaulu-Lihue section; and

WHEREAS, Citizens Communications Company, Kauai Electric Division (KE) was conveyed two hydroelectric power plants that were used to generate power for the Lihue Plantation operation; and

WHEREAS, the hydroelectric power plants rely on water from diversions on the North Fork of the Wailua River and Waikoko Stream known collectively as the "blue hole" diversion (diversion); and

WHEREAS, the two hydroelectric power plants' use of the water is a nonconsumptive use, because the water is used to generate hydroelectric power and then is returned to the system; and

WHEREAS, in 2001, KE requested a 65-year lease of water rights to the diversion from the Department of Land and Natural Resources (DLNR); and

I do hereby certify that the within document is a full, true and correct copy of the original on file in this office.

Chief Clerk
House of Representatives
State of Hawaii

H.C.R. NO. 124 H.D. 1

WHEREAS, in 2002, KE was sold to the Kauai Island Utility Cooperative (KIUC), a nonprofit cooperative electric company; and

WHEREAS, KIUC continues to operate the two hydroelectric power plants that supply electricity to the KIUC system; and

WHEREAS, in 2002 and 2003, the Board of Land and Natural Resources approved a revocable permit for KIUC to have continued use of the water at the diversion; and

WHEREAS, KIUC continues to seek a long-term lease of water rights from DLNR for the continued use of water at the diversion; and

WHEREAS, the security of a long-term lease would provide the financial justification for the capital expenditure required to refurbish the hydroelectric power plants and to perform the required maintenance and repairs that would continue and enhance the power production of the facilities; it would also provide sufficient, reliable electricity to meet the needs of the cooperative members of Kauai on a long-term basis; and

WHEREAS, section 171-58(c), Hawaii Revised Statues (HRS), requires prior approval of the Governor and prior authorization of the Legislature by concurrent resolution to issue a lease of water rights for nonconsumptive purposes; now, therefore

BE IT RESOLVED by the House of Representatives of the Twenty-second Legislature of the State of Hawaii, Regular Session of 2004, the Senate concurring, that KIUC adequately satisfy those conditions stipulated by the Board of Land and Natural Resources in its current revocable permit and resolve issues such as emergency water allocation before the issuance of a lease; and

BE IT FURTHER RESOLVED that the Board of Land and Natural Resources is hereby authorized to issue a lease of water rights to KIUC for the use of the "blue hole" diversion and portions of a water transmission system located in the Wailua section of the Lihue-Koloa forest reserve (Tax Map Key No. 3-9-01:1) for hydropower production purposes pursuant to section 171-58, HRS; and

Page 3

H.C.R. NO. 124 H.D. 1

BE IT FURTHER RESOLVED that a certified copy of this Concurrent Resolution be transmitted to the Chairperson of the Board of Land and Natural Resources.

Proposed Allocation of Water During Low Flow Periods Among the Diversions From the North Fork of the Wailua River at Blue Hole, the Stable Storm Ditch, and Wailua Reservoir

Prepared for:

Kauai Island Utility Cooperative
4463 Pahee Street - Suite 1
Lihue, Kauai, Hawaii 96766

Prepared by:

Tom Nance Water Resource Engineering
680 Ala Moana Boulevard - Suite 406
Honolulu, Hawaii 96813

April 20, 2004

EXHIBIT D

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01-22

Introduction

Condition 23.b of DLNR's Revocable Permit No. S-7340 requires Kauai Island Utility Cooperative (KIUC) to provide data and recommendations on the allocation of water from the North Fork of the Wailua River among competing uses during periods of low flow. Although not specifically stated, the allocation would presumably between KIUC's use of water for hydropower generation and agricultural irrigation on State lands previously leased to and irrigated by Lihue Plantation (LPCO). Assuming this to be the case, this memo and its attachments contain data and a recommended allocation plan to meet the requirements of Condition 23.b.

Overview of the System of Plantation Diversions

Historically, LPCO diverted water from the North Fork at three locations: into the Iliiliula-North Wailua Ditch at 1105-foot elevation at a location commonly referred to as "Blue Hole"; at 710-foot elevation into the Stable Storm Ditch; and at 480-foot elevation for delivery into the 240 million gallon (MG) Wailua Reservoir. The locations of these diversions are identified on Figure 1 and are characterized in the paragraphs following.

Blue Hole Diversion. At the 1105-foot elevation of the diversion, the stream's contributing watershed is 1.77 square miles. The amount of water diverted into the Iliiliula-North Wailua Ditch at this location was measured at USGS Gage 610 for 53 years from 1932 to 1985. Over this period, the average diverted was 12.1 million gallons per day (MGD). Its within-year variability, expressed in mean monthly flowrates, is depicted on Figure 2. Figure 3 is a duration-discharge curve for the 53 years of record. Water availability at this location has been relatively consistent within each year and from year to year. Water diverted at Blue Hole, together with amounts added from Waikoko and Iliiliula Streams and other minor intakes, was and continues to be used for electric power generation at the Upper and Lower Lihue hydropower plants now owned and operated by KIUC. The diversion from Waikoko Stream, as at Blue Hole, is on State land. All of the other diversions are on Grove Farm land.

Stable Storm Ditch. Historically, water available at the 710-foot elevation of the Stable Storm Ditch intake consisted of: streamflow at 1105-foot elevation which was not captured at the Blue Hole diversion; streamflow from the 3.21-square mile contributing watershed below the Blue Hole diversion; and water imported into this basin via the Hanalei Tunnel. The input from the Hanalei Tunnel was measured at USGS Gage 1000 from 1932 to 1985 and averaged 17.4 MGD over this period. Sometime after the gage was discontinued, importation to the basin via the tunnel also ended.

The 6000-foot long Stable Storm Ditch was used by LPCO to move water from the North Fork to the South Fork to supplement the irrigation supply for lands on the south side of the South Fork. The amount diverted, which was measured at USGS Gage 620, averaged 5.9 MGD from 1936 through year 2000. However, since its use was as a supplemental source of irrigation supply, the amount diverted was highly variable. It ranged from a high of 45 MGD to extended periods when no flow was diverted (Figures 4 and 5). The year of its greatest use, 1953, was among the driest years of record.

Diversion to the Wailua Reservoir. Diversion from the North Fork at 485-foot elevation into the Wailua Reservoir was done to supply sugarcane fields to the north of the Wailua River basin. The amount of water available at the point of diversion consisted of: water in the North Fork which was not diverted at the Stable Storm Ditch (this is essentially the amount measured at former USGS Gage 630 at 650-foot elevation); water from the 6.3-square mile East Branch of the North Fork watershed as measured by USGS Gage 680 at 500-foot elevation; and water originating on the 1.67-square mile watershed between USGS Gages 630 and 680 and the point of diversion at 485 feet. Historically, these sources averaged in excess of 78 MGD. Removing the input of the Hanalei Tunnel, the within-basin average streamflow at the point of diversion exceeded 60 MGD over the period of record. Its within-year variability is illustrated as monthly averages on Figure 6.

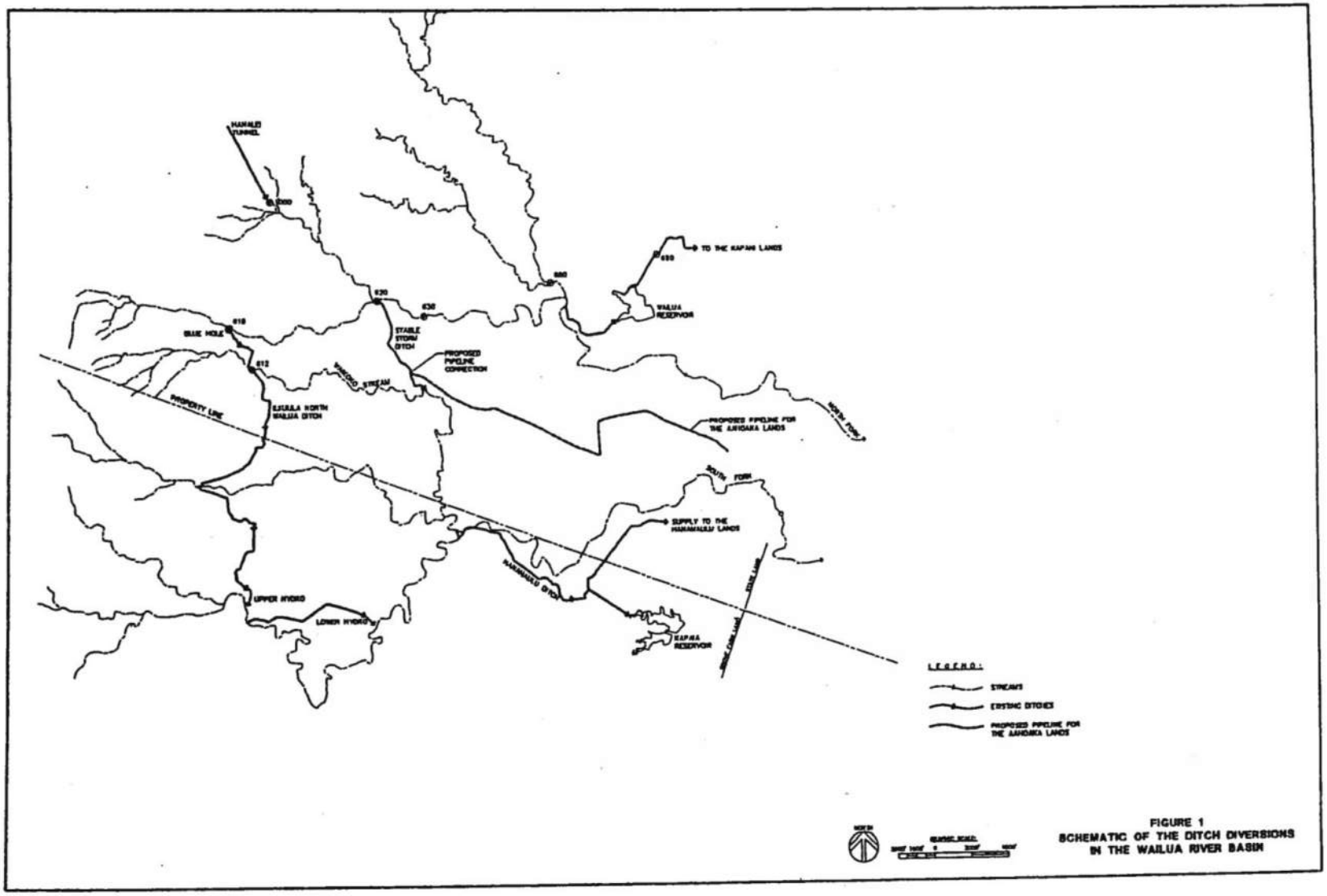


FIGURE 1
SCHEMATIC OF THE DITCH DIVERSIONS IN THE WAILUA RIVER BASIN

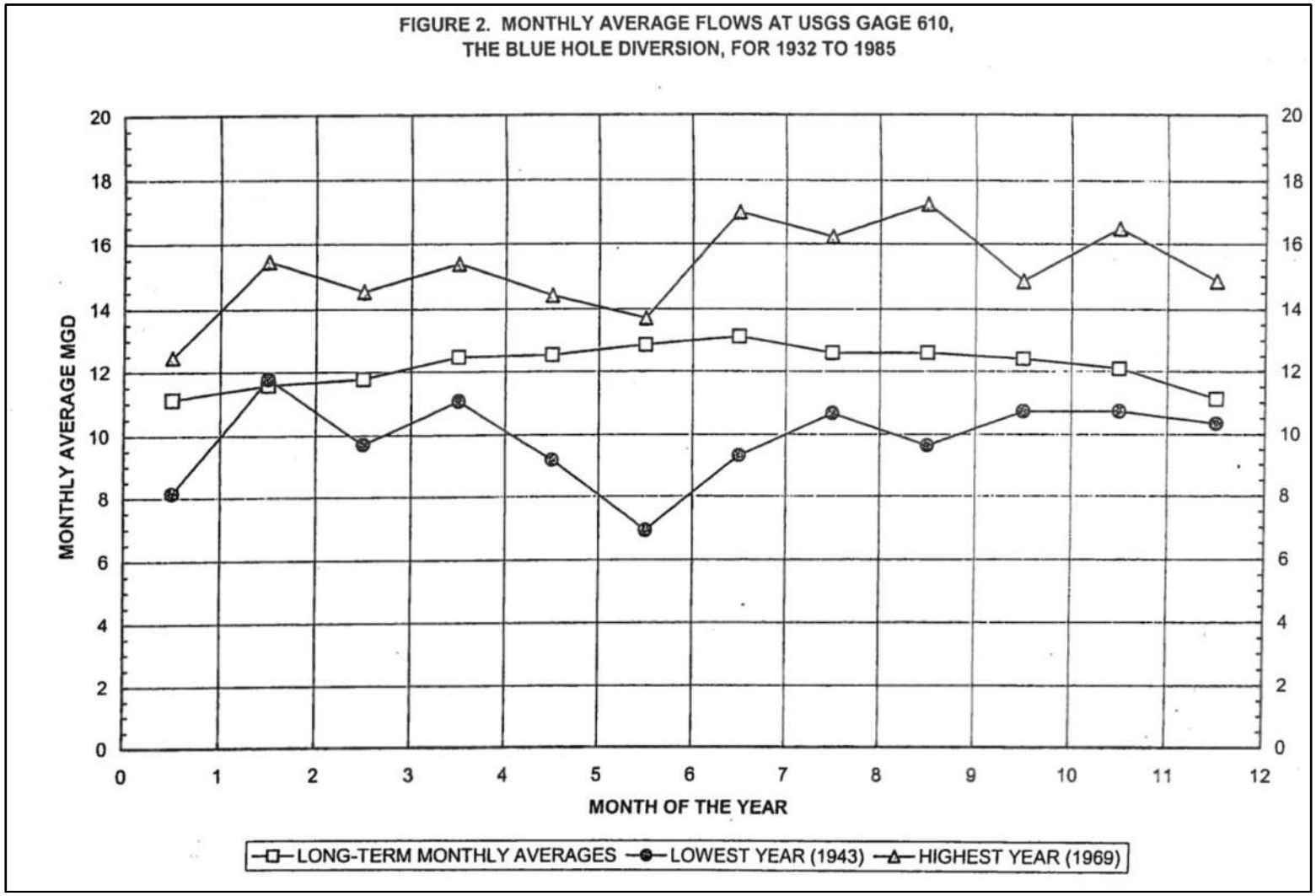


FIGURE 2. MONTHLY AVERAGE FLOWS AT USGS GAGE 610,
THE BLUE HOLE DIVERSION, FOR 1932 TO 1985
MONTHLY AVERAGE MGD
MONTH OF THE YEAR
LONG-TERM MONTHLY AVERAGES
LOWEST YEAR (1943)
HIGHEST YEAR (1969)

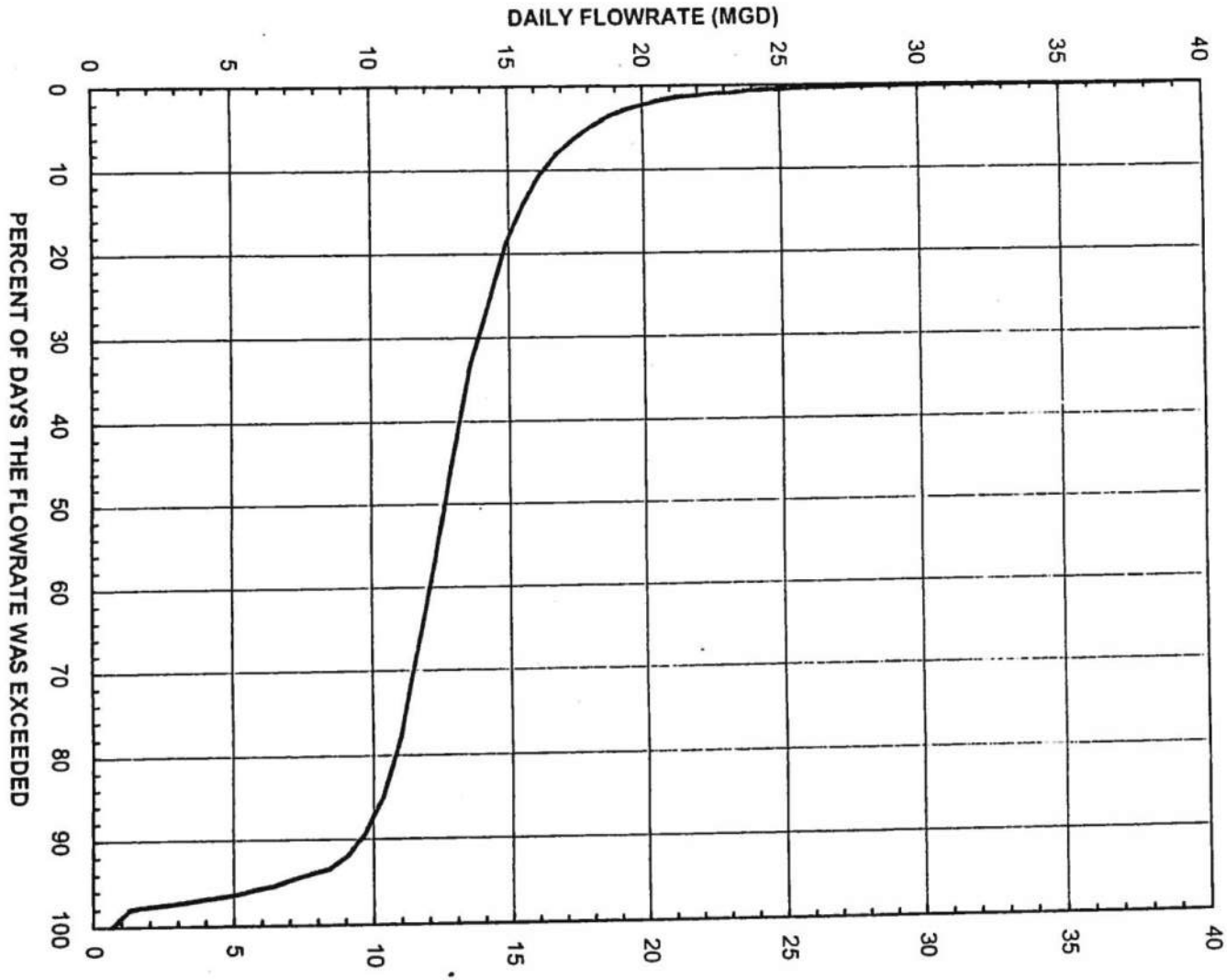


FIGURE 3. DURATION-DISCHARGE CURVE FOR USGS GAGE 610, THE BLUE HOLE DIVERSION, FOR 1932 TO 1985

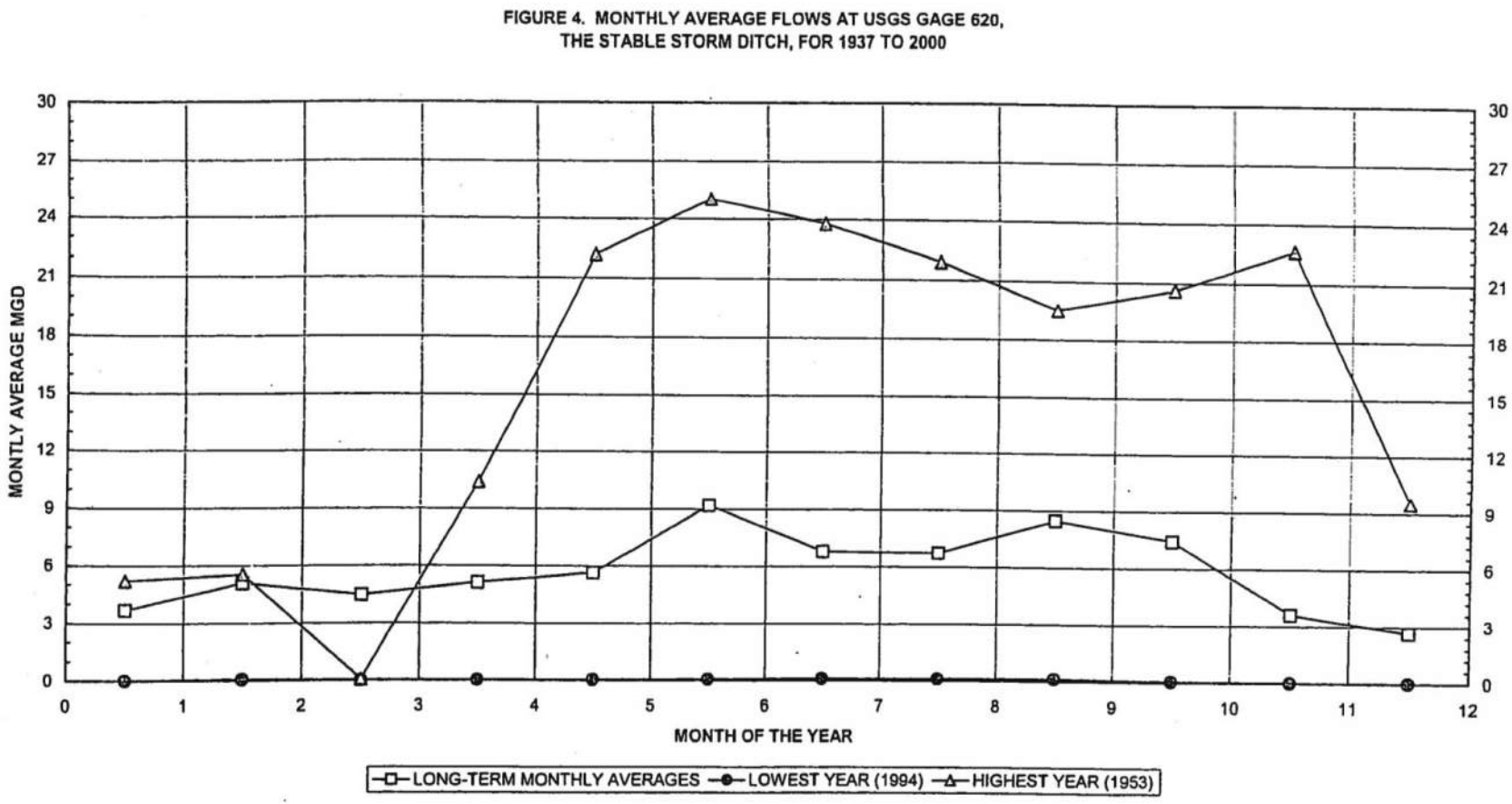


FIGURE 4. MONTHLY AVERAGE FLOWS AT USGS GAGE 620,
THE STABLE STORM DITCH, FOR 1937 TO 2000
MONTLY AVERAGE MGD
MONTH OF THE YEAR
LONG-TERM MONTHLY AVERAGES
LOWEST YEAR (1994)
HIGHEST YEAR (1953)

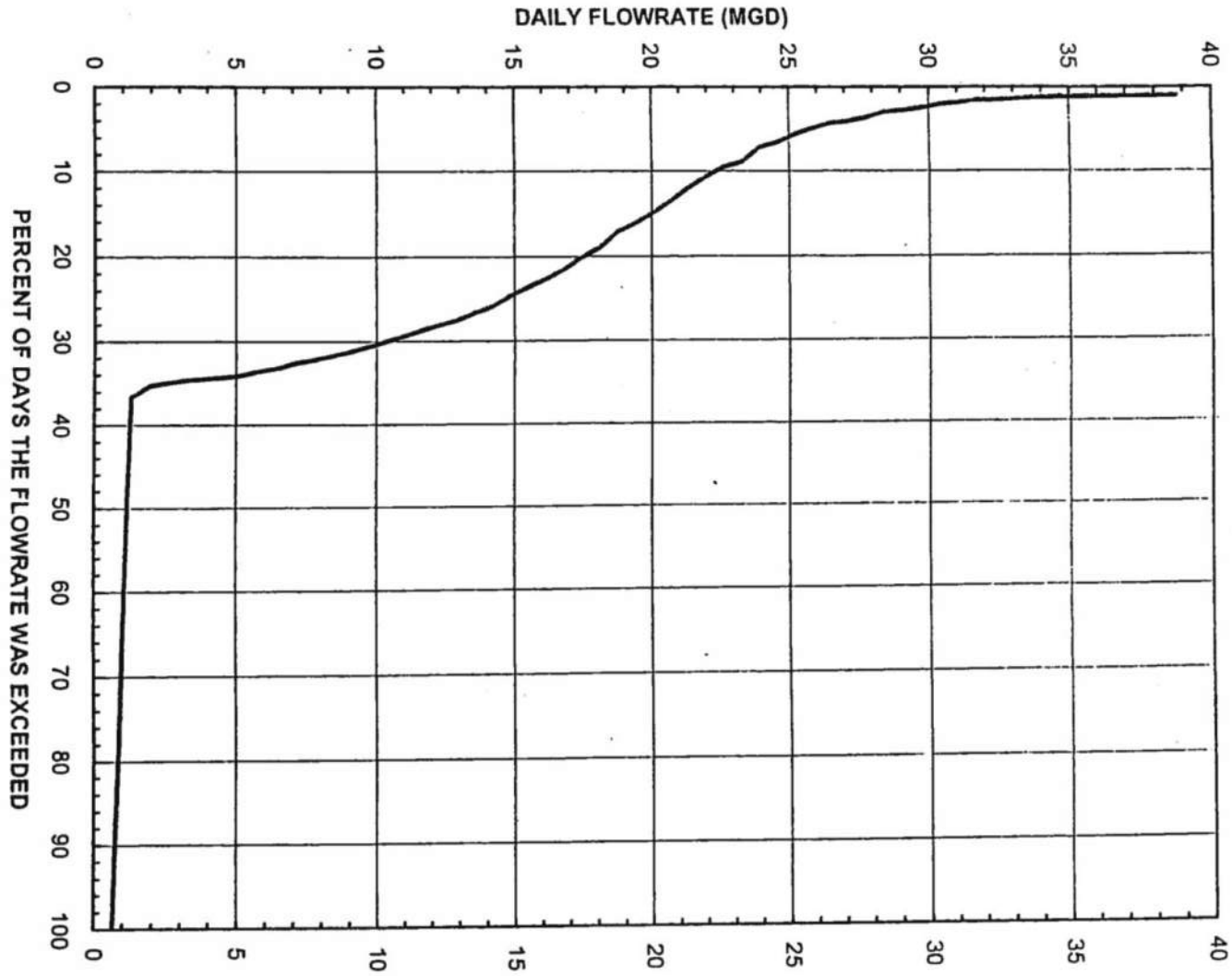


FIGURE 5. DURATION-DISCHARGE CURVE FOR USGS GAGE 620, THE STABLE STORM DITCH, FOR 1937 TO 2000

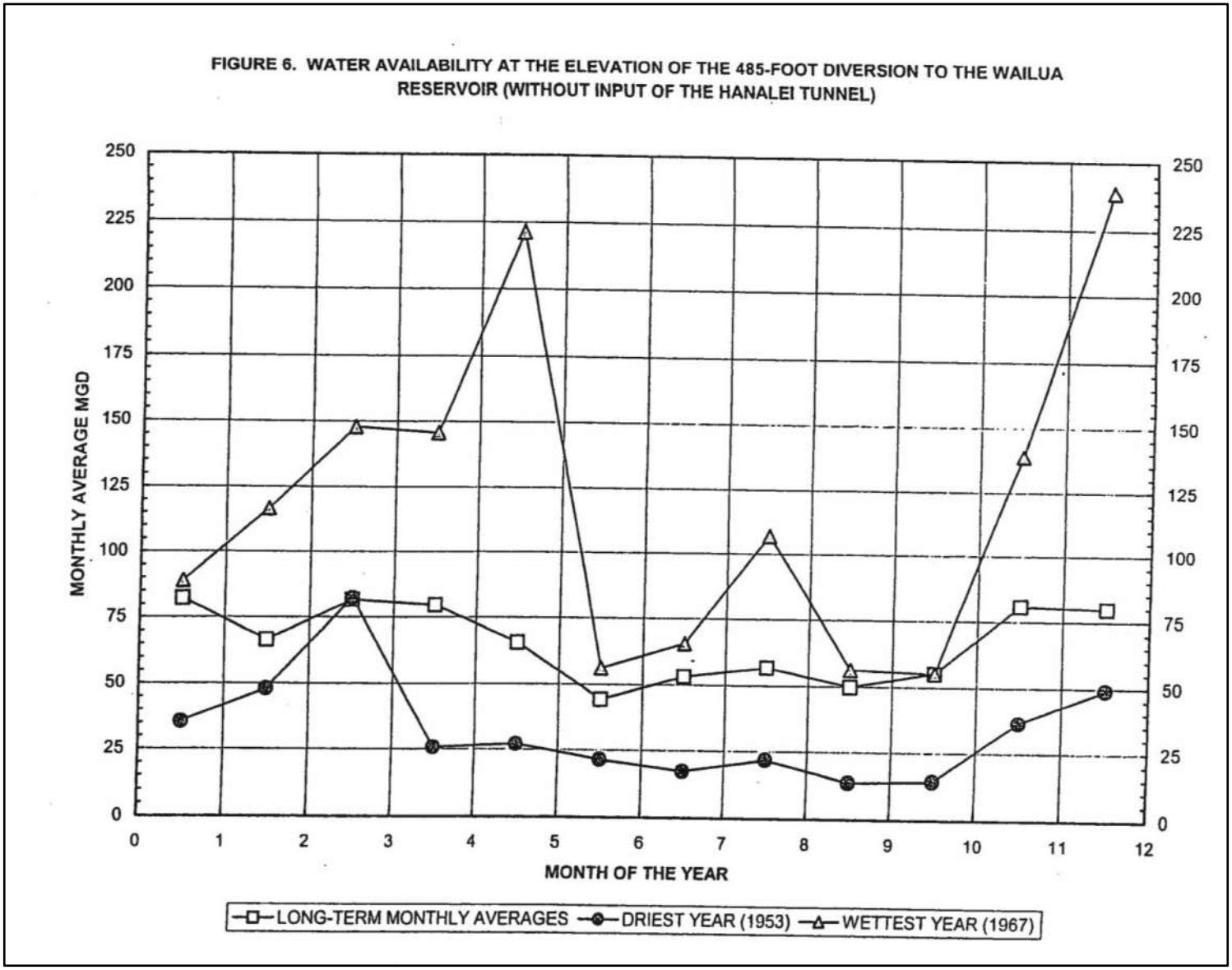


FIGURE 6. WATER AVAILABILITY AT THE ELEVATION OF THE 485-FOOT DIVERSION TO THE WAILUA RESERVOIR (WITHOUT INPUT OF THE HANALEI TUNNEL)
MONTHLY AVERAGE MGD
MONTH OF THE YEAR
0
25
50
75
100
125
150
175
200
225
250
0
1
2
3
4
5
6
7
8
9
10
11
12
LONG-TERM MONTHLY AVERAGES
DRIEST YEAR (1953)
WETTEST YEAR (1967)

Although the amount diverted into the 240 MG Wailua Reservoir was not measured, outflow from the reservoir has been recorded at USGS Gage No. 690 since 1936. Since that time, the reservoir's outflow has averaged 10.3 MGD, a small fraction of the available supply at the point of diversion. Within-year variability and the duration-discharge curve of the gaging record are illustrated on Figures 7 and 8.

Basic Premises of the Recommended Low Flow Allocation Plan

1. Past records of stream and ditch flowrates as measured at the USGS gaging stations are assumed to be representative of available flows at various points of diversion.

2. The allocation plan addresses water sharing between KIUC's use for hydropower and agricultural irrigation on State lands during periods when the available supply is insufficient for both uses. As the data reviewed above suggests, such occurrences will be relatively infrequent.

3. Water diverted from the North Fork for agricultural irrigation may be used on the following three areas:

   - Kapahi Lands. Lands to the north of the Wailua River basin which were historically supplied from the Wailua Reservoir via the Wailua Ditch are referred to herein as the Kapahi lands.

   - Hanamaulu Lands. State lands on the south side of the South Fork are referred to herein as the Hanamaulu lands. Historically, LPCO irrigated approximately 950 acres of these lands via the Hanamaulu Ditch. This ditch has the capability of returning water that was diverted from State lands at Blue Hole and Waikoko for hydropower back to the State lands in Hanamaulu. This route is shown schematically on Figure 1.

   - Aahoaka Lands. There are about 2200 acres of cultivable State land between the North and South Forks. The lower 1300 acres were farmed by LPCO without irrigation and the upper 900 acres have never been used for agriculture. These lands are referred to herein as the Aahoaka lands. The July 2001 "Study of East Kauai Water Systems on State of Hawaii Lands" prepared by ITC Water Management for DLNR's Land Division proposes a pipeline connection off the Stable Storm Ditch to supply these lands. It recommends the system be sized for a peak irrigation use of 6.5 MGD (4000 GPD/acre for the lower 1300 acres and 1000 GPD/acre for the upper 900 acres). The ITC-proposed pipeline from the Stable Storm Ditch to serve the Aahoaka lands is shown schematically on Figure 1.

4. It is assumed that irrigation supply for the State's Hanamaulu lands will continue to be supplied by the Hanamaulu Ditch by an agreement with Grove Farm. At a minimum, the available supply should be equivalent to the amount of water diverted by KIUC from State lands via the North Wailua Ditch and measured by KIUC at the site of former USGS Gage 612. Additional water deliveries may be available from Grove Farm.

5. The flow available for diversion into the Stable Storm Ditch for the Aahoaka lands can be reasonably approximated as the sum of flows measured at USGS Gages 620 and 630 less the Hanalei Tunnel import as measured at USGS Gage 1000.

6. The flow available at the diversion ditch to the Wailua Reservoir to irrigate the Kapahi lands is equal to or greater than the flow from the East Branch of the North Fork (USGS Gage 680) plus the amount not diverted into the Stable Storm Ditch as quantified in item 5 above.

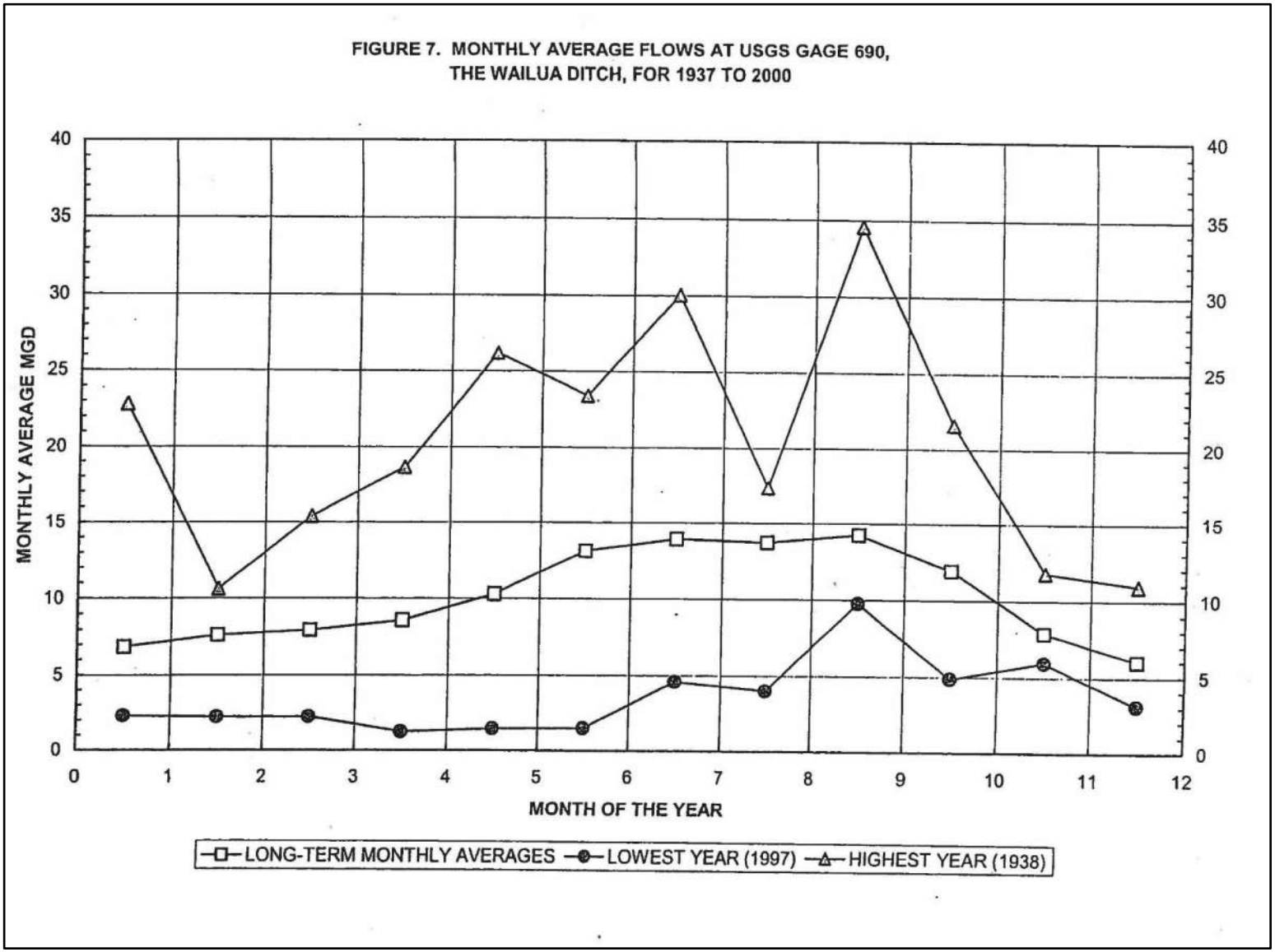


FIGURE 7. MONTHLY AVERAGE FLOWS AT USGS GAGE 690,
THE WAILUA DITCH, FOR 1937 TO 2000
MONTHLY AVERAGE MGD
MONTH OF THE YEAR
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
7
8
9
10
11
12
LONG-TERM MONTHLY AVERAGES
LOWEST YEAR (1997)
HIGHEST YEAR (1938)

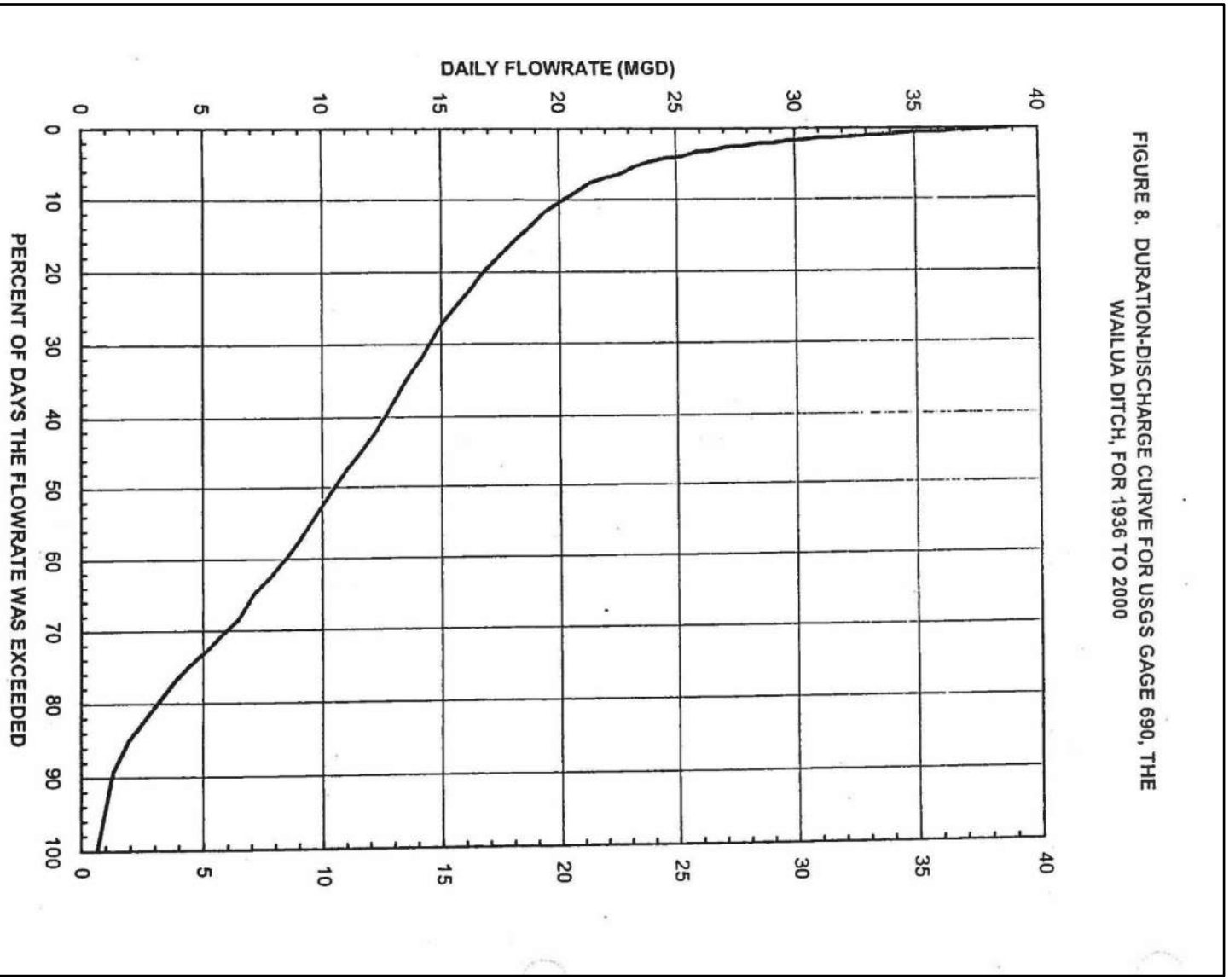


FIGURE 8. DURATION-DISCHARGE CURVE FOR USGS GAGE 690, THE WAILUA DITCH, FOR 1936 TO 2000

7. As a basis for developing the low flow allocation plan, monthly average flows provide a sufficient indication of water availability at the points of diversion. Using monthly averages avoids much more cumbersome computations using daily flow data.

8. The two driest periods of record were April through October of 1953 and December 1983 through October 1984. Water availability at the three points of diversion on the North Fork during these two drought periods are compiled on Table 1. These compilations indicate that if the full 6.5 MGD of irrigation use estimated by ITC for the Aahoaka lands existing during these low flow periods, there would have been several months during each drought when the full irrigation supply would have required a small reduction of the diversion for hydropower.

Recommended Low Flow Allocation Plan

Based on the foregoing analyses, the logistical impracticality of splitting the flow at the Blue Hole diversion between competing uses, and the infrequency of an actual shortage of irrigation supply occurring, the following drought-period allocation plan is recommended:

1. At a minimum, the supply to irrigate the State's Hanamaulu lands on the south side of the South Fork should be the amount diverted from State lands for hydropower generation as measured by KIUC at the former USGS Gaging Station No. 612 site and returned to these State lands by Grove Farm via the Hamakua Ditch.

2. If the supply required for actual agricultural use on any of the 2200 acres of the State's Aahoaka lands between the North and South Forks exceeds the available supply at the Stable Storm Ditch diversion, KIUC will, at the direction of the State, stop all diversion at Blue Hole until the supply deficiency no longer exists. For the purposes of this provision and based on the July 2001 ITC study, a deficiency shall mean that the available supply at USGS Gage 620 on the ditch is less than 4000 GPD times the number of acres being cultivated on the lower 1300 acres of the Aahoaka lands plus 1000 GPD times the number of acres being cultivated within the upper 900 acres of the Aahoaka lands. For this period of a deficient supply, water available for hydropower generation shall be the amount diverted from Waikoko Stream on State land and the system's other intakes on Grove Farm land.

3. Similarly, if the required supply for actual agricultural use on the Kapahi lands to the north of the Wailua Basin exceeds the available supply then KIUC will, at the direction of the State, stop all diversion from Blue Hole until the supply deficiency no longer exists. For the purposes of this provision, an irrigation supply deficit means that the combined supply from the 485-foot stream diversion and drafts from the Wailua Reservoir, as measured at USGS Gage 690 on the outflow ditch, exceeds 4000 GPD times the number of acres being cultivated within the area previously supplied by LPCO from this ditch system. Prior to the implementation of this drought allocation plan, the exact extent of the Kapahi lands shall be specified using LPCO field maps.

4. Maintenance of the Blue Hole intake will be the responsibility of KIUC. It shall be the State's obligation to maintain all other intakes and ditch systems so that the irrigation deficiency is due to an actual deficit of supply and not due to inefficient capture at the stream intakes or excessive losses in the ditch system due to inadequate maintenance.

The life of the land is perpetuated in righteousness

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6962
Fax: 808-245-3277

RECEIVED
2004 AUG 10 P 3:38

TO: Mr. Morris Atta
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

August 9, 2004

RE: **Ditch Easement Through LLC Land**

Aloha, Morris:

I'm enclosing a map of our system indicating the three separate portions of water conduit involved in transporting water from the Blue Hole diversion to Hanamaulu Ditch. Ideally, all three components would be part of an easement agreement with LLC.

The first component, to the left of the black line on the map indicating the boundary of LLC land and State Kalepa lands is the North Wailua Iliiliula Ditch on LLC Land (in black). This ditch feeds the two powerhouses.

The second component is the South Fork of the Wailua River (in blue), which transports the water down to the Hanamaulu Ditch diversion.

The third component is the Hanamaulu Ditch itself (in green) until it enters the State lands.

I don't know if an easement can be created for the South Fork itself. There is established precedence that the ditch systems can include streams into which water is dumped and then rediverted later. In the State systems, such as the Coop's, the State does not have title to these sections of streams, but only on the ditches feeding and drawing from them.

We're hoping this easement can be done in a manner which establishes a single pathway for the water from Blue Hole to Hanamaulu Ditch. As you know, at this point, the AG's opinion is that once the water is dumped in the South Fork after the power houses, its ownership is unclear. There may be nothing to prevent LLC (or some future land owner) from claiming this water in the future and not supplying Hanamaulu Ditch.

It may even be necessary to adjust how the State looks at the Blue Hole diversion. At this point, KIUC is no longer responsible for the water once it

EXHIBIT "E"

enters the South Fork. We have always held that the responsibility should end only when the water gets back to the State land. This is because we can't have an RP on the water when it leaves the powerhouse, or perhaps we can. The idea is to avoid giving the water to LLC. A suitable arrangement wouldn't necessarily involve any cost to KIUC, as we would pay for the maintenance of LLC's portion of Hanamaulu Ditch (which we do now).

The Blue Hole diversion has historically diverted water for agricultural purposes, and the powerhouses were incidental. Now, the water is being diverted for power and agriculture is incidental. When the diversion comes up for a long-term lease, as KIUC is pushing for, we think this issue will surface. It can be avoided if the KIUC lease includes the return of the water to agricultural use at the end.

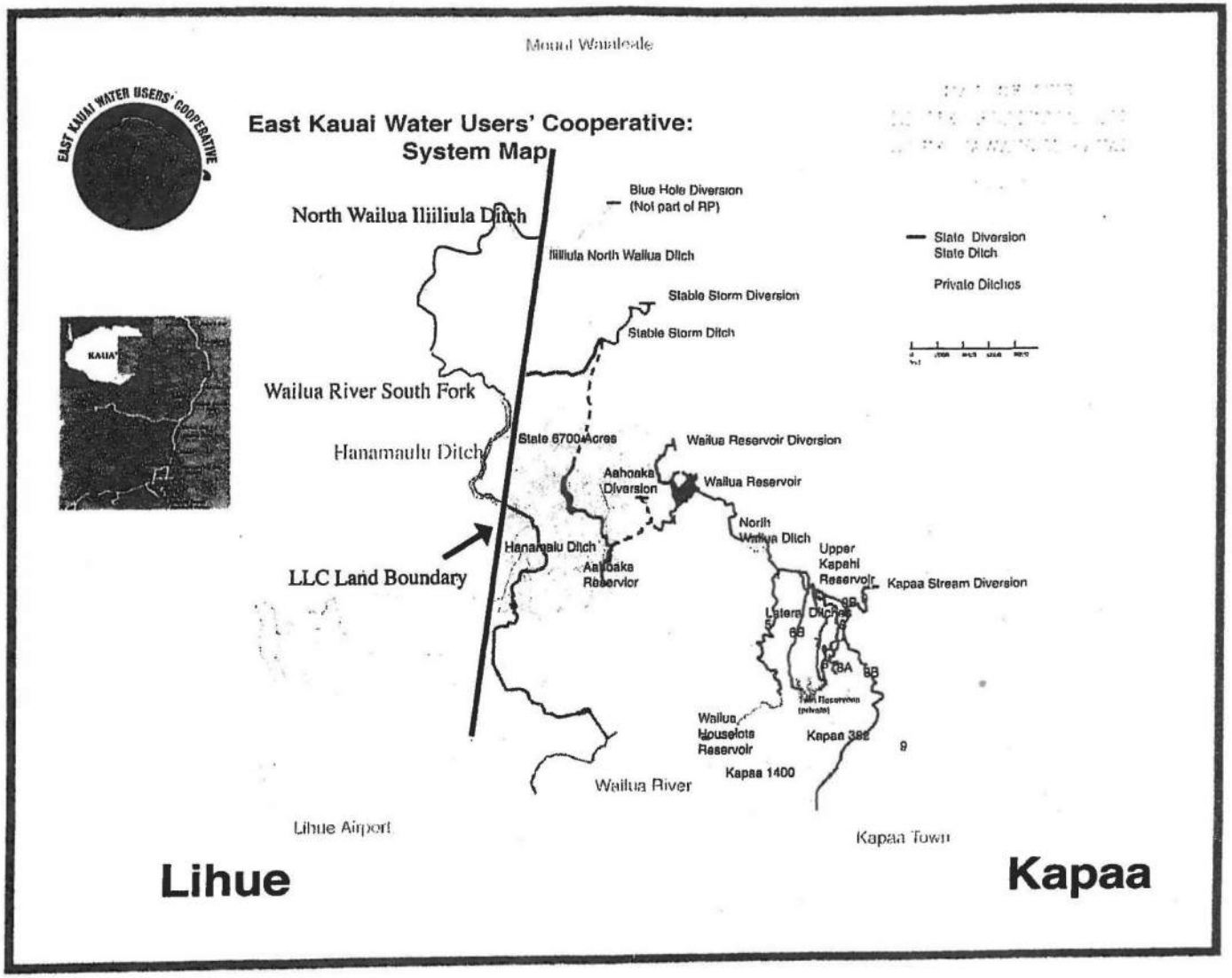
I hope that helps in your general understanding of the issues.

Sincerely yours,

East Kauai Water Users' Cooperative

Rev. Swami Arumugam Katir

Rev. Swami Arumugam Katir


East Kauai Water Users' Cooperative:
System Map
EAST KAUAI WATER USERS' COOPERATIVE
North Wailua Iliiliula Ditch
Blue Hole Diversion
(Not part of RP)
Iliiliula North Wailua Ditch
Stable Storm Diversion
Stable Storm Ditch
State Diversion
State Ditch
Private Ditches
Wailua River South Fork
Hanamaulu Ditch
State 6700 Acres
Wailua Reservoir Diversion
Aahoaka Diversion
Wailua Reservoir
North Wailua Ditch
Upper Kapahi Reservoir
Kapaa Stream Diversion
LLC Land Boundary
Hanamaulu Ditch
Aahoaka Reservior
Wailua Houselots Reservoir
Kapaa 1400
Wailua River
Lihue Airport
Kapaa Town
Lihue
Kapaa

Post-it® Fax Note 7671	Date 12-1	# of pages ▶ 5
To Morris A.	From Rebecca A.	
Co./Dept.	Co.	
Phone #	Phone # 7-3952	
Fax # 587-0455	Fax #	

LINDA LINGLE
GOVERNOR
STATE OF HAWAII

STATE OF ...

DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

November 23, 2004

To: Peter T. Young, Chairperson
Board of Land and Natural Resources

From: Micah A. Kane, Chairman
Hawaiian Homes Commission

Subject: Notice of Intent to Execute a New Water Lease
Applicant: Kauai Island Utility Cooperative
Location: Wailua, Lihue, Kauai, Hawaii
Tax Map Key: (4) 3-9-1:01 & (4) 3-8-1:01

This is in response to your letter dated November 12, 2004 requesting testimony on a new 65-year water lease to Kauai Island Utility Cooperative (KIUC), a non-profit corporation, pursuant to Hawaii Revised Statutes (HRS) §171-13, -55, and 58. The application is for surface water diverted at the Iliiliula north Wailua Ditch including the "Blue Hole" diversion for a non-consumptive use at its two hydropower plants. KIUC is currently permitted to use water under a one-year Revocable Permit No. S-7340 first issued in December 2002. The water lease sought by KIUC would allow KIUC to continue to use the water for hydropower generation at its two hydroelectric plants for up to 65 years.

The Department of Hawaiian Home Lands (DHHL) believes that this request is premature and respectfully requests that the Board of Land and Natural Resources (Board) grant an extension of one year to Permit No. S-7340, rather than a 65-year lease, for the following reasons.

1. A watershed management plan has not been approved by the Board. Therefore, the Board must direct the department's staff to bring the matter back for further consideration after undertaking the higher level of scrutiny required by HRS §171-58 and other legal requirements.

EXHIBIT F

Peter T. Young
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2. DHHL requests more time to determine the amount of water to reserve as we were given only a one week notice that this issue was before the Board.

3. Ch. 171-58, HRS is silent on how the Department of Land and Natural Resources (DLNR) will establish DHHL's reserved amount of water.

Section 171-58(e), HRS, requires that "any new lease of water rights shall contain a covenant that requires the lessee and the Department of Land and Natural Resources to jointly develop and implement a watershed management plan. The board shall not approve any new lease of water rights without the foregoing covenant or a watershed management plan." A covenant or watershed management plan has not been approved by the Board relevant to this submittal.

Section 171-58(g), HRS, requires that "the Department of Land and Natural Resources notify DHHL of its intent to issue a water lease and collaborate to develop a reservation of water rights sufficient to support current and future homestead needs. Any lease of water rights or renewal shall be subject to the rights of DHHL as provided by section 221 of the Hawaiian Homes Commission Act. DHHL was only recently informed that DLNR is considering a water lease, therefore, we have not adequately prepared our estimated water needs.

It is not clear how or where Ch. 171-58, HRS will reserve water. For example, The Water Code, Ch. 174C-49(d), HRS, states that the Water Commission "may reserve water by rule". DHHL has approved water reservations in three aquifers, none are on Kauai.

In the appeal from the Commission on Water Resource Management, the Hawaii Supreme Court stated in Waiola (2004), that DHHL's reservation is a protected public trust use. This court held, "that, while the state water resources trust acknowledges that private use for 'economic development' may produce important public benefits and that such benefits must figure into any balancing of competing interests in water," private commercial use is not a public trust purpose. (emphasis in original). The court further stated that "the planning and

Peter T. Young
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allocation of water resources for purposes of economic development must account for the public trust and protect public trust uses to the extent feasible." Finally, Waiola stated that the Applicant for a water use has the burden of establishing that the proposed use will not interfere with DHHL's reservation. Since there is no water reserved in DHHL's favor and no means to reserve it, the Applicant has not met their legal burden to protect our reservation.

The area covered under this lease agreement is from the Blue Hole diversion to the hydropower plant. How DLNR will provide a reserved amount to our property located downstream is unknown. The DLNR submittal states that when AMFAC concluded the sale of its property, including land served by the Blue Hole diversion, to the Lihue Land Company (LLC), it failed to include in the conveyance, any reservation in favor of the State, ditch easements or right of way to guarantee that irrigation water will continue to flow through LLC property to State land at Kalepa, including DHHL land. DHHL is unaware that a conveyance document takes precedence over the public trust doctrine enunciated by the Waiahole and Waiola courts. Lihue Land Co., states that it may be riparian to the former ditch and that it may not be obligated to provide water to other, presumably riparian ditch/stream users located downstream. Further, LLC states that it will charge a fee to downstream landowners for maintenance of its private property as the water passes through. DHHL will not pay an upstream private landowner maintenance fees to utilize our reserved water rights.

In May 2004, DHHL finalized its Kauai Island Plan. This Plan provides recommendations for the future use of DHHL's 20,565 acres on Kauai. DHHL owns 526 acres in Wailua located downstream of KIUC's hydropower plant and diversion. There are 52 acres makai of Kuhio Highway and 474 acres on the mauka side of the highway. The property was previously in sugarcane production.

Wailua is a priority development area and will be the second largest DHHL community on the island. On the mauka side of the highway, the island plan proposes to construct 651 residential units, a 12-acre school/park, 50 units of kupuna housing and day-care center, with full-build expected over the

Peter T. Young
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next 20 years. The makai area is planned to be a regional commercial and social service center. The commercial and community uses will accommodate residents and visitors to Kauai's east and north sides, generate income for DHHL, as well as provide jobs for our beneficiaries. The DHHL District Office is already planned for this area.

Some of DHHL's best agricultural land is located in Wailua. A 99-acre agricultural community is planned to take advantage of the existing ditch and fertile soil. The ditch is from the sugar plantation era and provides irrigation water through a tunnel in Kalepa Ridge, located downstream from the hydropower plant. Community groups have expressed interest in ditch use for taro loi. Most of the agricultural lands are located away from Kuhio Highway reflecting the community's desires to create opportunities for organic farming. Nearby, 52 acres are already in pasture use.

Bordering the ditch along the western side is designated a Special District in order to preserve and protect the water flowing through the property. A Special District is defined by DHHL as "environmentally or culturally sensitive. Lands in this category should be protected but also made available for certain community and commercial uses."

To provide water to our new residential subdivisions, agricultural, and commercial needs will require new wells and continued use of the ditch. It would be helpful to understand the water quality in the hydropower plants' outfall to determine its affect on our proposed uses and reservation. There is nothing in the record to show volume, temperature, silt, or chemical changes to the water as it flows through the plant. A watershed management plan could address these issues.

Lastly, Article XII, Section 1 of the Hawaii State Constitution states that thirty percent of the state receipts derived from water licenses shall be transferred to the Native Hawaiian Rehabilitation Fund. Previously, the water was valued according to GL S-3847, a consumptive use of water to irrigate sugar cane. While KIUC's use may be non-consumptive, the diversion of water for industrial use is now the issue. If industrial is considered the "highest and best use" of the land,

Peter T. Young
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then the appraised value of the water should reflect this. Please advise DHHL on the Board's appraisal of the water pursuant to the entitlement issues.

Thank you for the opportunity to testify. We look forward to working with the Board on this matter.

EXHIBIT 2

Written testimony was received from Reverend Swami Arumugam Katir, Beth Tokioka, the Limu Coalition, the Hanalei Watershed Hui, Carol Wilcox and Rex Johnson of the Hawaii Tourism Authority.

The Board amended the Recommendation Section by amending the rent to be $156 per year (or $13 per month) during an interim period until the irrigation system is set-aside to either the Department of Agriculture (DOA) or Agribusiness Development Corporation (ADC). Within the next three months, staff shall bring back to the Board a proposal to set aside the water system to either the DOA or ADC.

Approved as amended by the remaining Board members (Agor/Inouye).

Item D-26: Sale of 65-year Lease at Public Auction of Water Rights for the Use of the "Blue Hole" Diversion and Portions of a Water Transmission System, Lihue-Koloa Forest Reserve (Wailua Section), Wailua, Lihue, Kauai, TMK: (4) 3-9-01:01 & (4) 3-8-01:01 for Hydropower Generation, Non-Polluting and Non-Consumptive Use.

Member Johns recused himself.

Ms. Mamiya communicated at the December 2002, meeting the Kauai Island Utility Cooperative (KIUC) was issued a revocable permit which allowed them to use water from the Blue Hole Diversion and a portion of state-owned water transmission system for its Upper and Lower Lihue Hydropower plants. Also in April 2004, KIUC obtained Concurrent Resolution from the Legislature for their use of water at the Upper and Lower Lihue Hydroelectric Plants. Being that the submittal involves water rights for non-consumptive use, Ms. Mamiya pointed out under section 171-58, HRS the department is required to notify the Department of Hawaiian Home Lands (DHHL) of its intent to execute a lease and to develop a reservation of water rights sufficient to support current and future homestead needs. DHHL had some concerns about this issue but after consultation with staff and the applicant they've agreed that staff's submittal does not need to be held up due to their concerns. Ms. Mamiya recommended the Board authorize the sale of a water lease by public auction for the use of water located on TMK No. 3-8-01:1 (4th Division) from the Blue Hole Diversion, including a portion of the state owned ditch system and such roadways and access over state lands for the operation, maintenance, and repair of the system.

Alton Miyamoto, President and Chief Operating Officer of KIUC reminded the Board this process began in 2001 and since that time KIUC has been working towards today's submittal. Mr. Miyamoto went into the history of the existence of KIUC.

Gary Pierce of KIUC conducted a brief presentation of the physical layout of the hydroelectric plant, the Blue Hole Diversion system and the ditch. Mr. Pierce used a map and pictures to explain the diversion of the water. In his presentation, Mr. Pierce pointed

EXHIBIT "2"

out there is no consumptive use of the water, all of the water is released back into the Hanamaulu ditch.

Jonathan Scheuer, Policy Analyst for the Office of Hawaiian Affairs (OHA) spoke of three of their concerns: 1) the submittal errs in concluding the use is nonconsumptive; 2) staff errs in recommending that an Environmental Assessment not be prepared under Chapter 343, Hawaii Revised Statutes; and 3) the public trust doctrine, which does not only guide the action of the Commission on Water Resource, but all agencies when dealing with water and other public trust resources, places the burden on the Board and the applicant to affirmatively demonstrate that public trust purposes will be considered and the uses balanced. Based on the above concerns, Mr. Scheuer requested a contested case hearing on behalf of OHA.

Motion made at 12:25 p.m. by Member Agor and second by Member Inouye to move into Executive Session pursuant to Chapter 92-5 (4) to consult with the board's attorney on questions and issues pertaining to the board's powers, duties, privileges, immunities and liabilities.

Motion to move into Executive Session
Unanimously approved to move into Executive Session (Agor/Inouye).

The meeting resumed at 12:53 p.m.

Deputy Attorney General, William Wynhoff advised the Board to end all testimony relating to agenda item D-26 as a request has been made for a contested case hearing.

Moses Haia, an attorney for Native Hawaiian Legal Cooperation suggested the Board inform the public at the beginning of the meeting that if a contested case hearing is requested on an item, all testimony on this item will cease. Mr. Haia requested a contested case hearing on behalf of Life of the Land.

Linnel Nishioka, attorney for the applicant made it known she believes a request for a contested case hearing is not available for the disposition of a lease.

Written testimony was received from the Limu Coalition, the Hanalei Watershed, Carol Wilcox and Clyde Namuo of OHA.

Chairperson Young notified those wishing to request a contested case hearing that they will need to follow up their verbal request with a written request within ten (10) days.

No Action.

Item D-18: Re-Submittal – Sale of Reclaimed (Filled) Lands to Beth Clark, Trustee of the Big Surf Trust, Kailua-Kona, North Kona, Hawaii, TMK: (3) 7-5-05: seaward of Parcel 12.

15

EXHIBIT 3

STIPULATION FOR WITHDRAWAL OF REQUEST
FOR CONTESTED CASE HEARING

WHEREAS, on November 9, 2006, Kauai Island Utilities Cooperative ("KIUC") and The Office of Hawaiian Affairs ("OHA") fully executed a Memorandum of Agreement ("MOA") (attached hereto as Appendix A) relating to OHA's request for a contested case on KIUC's application to the Board of Land and Natural Resources ("BLNR") for a 65-year lease to use water from State lands and collected from Waikoko Stream and the North Fork of the Wailua River (collectively referred to as the "Blue Hole Diversion") for the purpose of continuing to operate two of KIUC's hydroelectric plants; and

WHEREAS, pursuant to the terms of the MOA, OHA agreed to withdraw its request for a contested case hearing, which was made on December 20, 2004, upon the occurrence of all of the events set forth below in italics; and, as described below, all such events have occurred:

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LAND DIVISION
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DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

(1) *Following consultation with the Department of Land and Natural Resources' Division of Aquatic Resources, OHA and KIUC have mutually agreed on a stream biota study for the diversion located on the North Fork of the Wailua River that either (1) no further studies are needed, or (2) upon the scope an additional study and the consultant who will conduct such additional study. The purpose of this study will be to determine if any significant impacts are associated with that diversion on stream biota.*

The Department of Land and Natural Resources Division of Aquatic Resources ("DAR") has proposed a stream biota modeling study, as set forth in Appendix B, upon which OHA and KIUC have mutually agreed. OHA and KIUC further agree that Dr. James Parham, through the Bishop Museum, and SWCA Environmental Consultants ("SWCA") will conduct the study and that the results of the study shall be available to OHA, KIUC, and DAR.

(2) *OHA and KIUC have mutually agreed upon the scope of a study of cultural impacts relative to the Blue Hole Diversion and the consultant who will conduct such study.*

A Cultural Study relating to the Waiahi Hydropower Systems was prepared by L. Kēhaulani Kekua and A. Aikane Alapai of Native Kaua'i LLC in April 2010, which described the cultural backdrop, but did not adequately address or assess cultural impacts relative to the Blue Hole Diversion. OHA and KIUC have mutually agreed upon a supplemental

Stipulation for Withdrawal of Request for Contested Case Hearing
KIUC and OHA (Blue Hole Diversion)
Page 1 of 4

EXHIBIT "3"

study, the scope of which is set forth in Appendix C, and which shall be conducted by Native Kaua‘i LLC.

(3) *OHA and KIUC have mutually agreed upon a methodology for setting the lease rent for proposal to the Department and Board of Land and Natural Resources. Said methodology shall consider the instream value of the water had it not been diverted for hydropower generation and the cost benefits to KIUC members, including, but not limited to, OHA beneficiaries.*

OHA and KIUC have mutually agreed to propose to the Department of Land and Natural Resources ("DLNR") and BLNR a methodology for setting the lease rent, as set forth in Appendix D, and described herein. Because negligible water quality impacts are involved in the non-consumptive use by KIUC, OHA and KIUC agree to applying fair market rental based on the rate charged by the East Kaua‘i Water Users Cooperative or other gravity-fed, surface water system on Kaua‘i that is used for agricultural purposes and discounting that rate by 95 percent because of the non-consumptive nature of the water use.

(4) *OHA and KIUC have mutually agreed upon a short-term spot water quality monitoring program for the Upper and Lower Waiahi hydropower plants.*

SWCA prepared a report entitled *Short-Term Biological Reconnaissance and Spot Water Quality Sampling in the Wailua River, Kauai*, dated August 2008, which is attached hereto as Appendix E. After consultation with DLNR Division of Aquatic Resources, OHA and KIUC agree that this report fulfills this requirement.

(5) *OHA and KIUC mutually agreed upon the protocol and parameters of a long-term program for collection of stream water quality data.*

After consultation with DLNR Division of Aquatic Resources, OHA and KIUC have mutually agreed on the long-term program for collection of stream water quality data as set forth in SWCA's July 2010 *Recommended Long-Term Water Quality Monitoring Plan, Wailua River, Kauai, Hawaii*, which is attached hereto as Appendix F.

(6) *KIUC has provided OHA (existing) flow data available to KIUC on Waikoko Stream and the North Fork of the Wailua River.*

KIUC has provided to OHA the flow data contained in Appendix G.

(7) OHA and KIUC have mutually agreed to seek proposed lease provisions that balance KIUC's business interests with OHA's fiduciary duties and OHA and KIUC have submitted to the DLNR, for proposal to the BLNR a proposed form of lease that includes provisions mutually agreed upon with respect to:

(i) A sixty-five-year lease term with provisions for renegotiation of lease terms upon either:

(a) significant changes in policy or economic conditions associated with the conveyance of relevant ceded lands to a federally-recognized Native Hawaiian Governing Entity, provided that renegotiation pursuant to such terms shall be initiated no later than ninety (90) days following the conveyance of the relevant ceded lands; or

(b) significant environmental or cultural changes, which, for purposes of this subparagraph shall mean changes in the environment or Native Hawaiian culture, or material changes in policy, which, if the lease were to be reviewed under such new policy or in light of such new information or understandings, would likely result in material changes to the terms of the lease; including, but not limited to, the mechanism and process for renegotiation of the lease terms;

(ii) A methodology for establishing the upset price (lease rent) at public auction of the lease; and

(iii) A long-term program for collection of stream water quality data.

OHA and KIUC have mutually agreed to propose to BLNR and DLNR a lease in the form set forth in Appendix H; and

WHEREAS, pursuant to the MOA, Section B, following OHA's withdrawal of its request for a contested case, and prior to a decision by BLNR to issue a lease, four (4) further steps are to occur; and

WHEREAS, subsection B(4) requires KIUC to "have joined the Kauai Watershed Alliance," but OHA and KIUC have investigated that possibility and learned that the Kaua‘i Watershed Alliance ("KWA") only allows members who own more than one

Stipulation for Withdrawal of Request for Contested Case Hearing
KIUC and OHA (Blue Hole Diversion)
Page 3 of 4

thousand (1,000) acres of watershed, conservation-district-zoned land, which KIUC does not.

NOW, THEREFORE, pursuant to the foregoing, in accordance with the terms of the MOA, and with acknowledgement of both parties' cooperation in the matter, KIUC and OHA enter into this Stipulation for Withdrawal of Request for Contested Case Hearing ("Stipulation"). Concurrently, both parties waive the requirement for KIUC to join KWA prior to the issuance of a lease by BLNR.

This Stipulation may be executed in counterparts. Upon execution, this Stipulation shall be transmitted to the Chairperson of the BLNR and to DLNR's Land Division and shall serve as notice of OHA's withdrawal of its request for a contested case on KIUC's application for a 65-year lease of water collected at the Blue Hole Diversion.

OFFICE OF HAWAIIAN AFFAIRS

Stedell L Poo

for KAMANA'OPONO CRABBE, Ph.D
Its Ka Pouhana and
Chief Executive Officer

Dated: June 29, 2012

KAUAI ISLAND UTILITIES COOPERATIVE

Name:

Its:

Dated: _____

APPROVED AS TO FORM:

Ernest M. Kimoto

ERNEST M. KIMOTO
Corporate Counsel
Date: June 29, 2012

Stipulation for Withdrawal of Request for Contested Case Hearing
KIUC and OHA (Blue Hole Diversion)
Page 4 of 4

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
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STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

October 10, 2016

Bryan Wienand
County of Kaua‘i, Department of Water
4398 Pua Loke Street
Līhu‘e, Hawai‘i 96766
Email: bwienand@kauaiwater.org

Dear Mr. Wienand,

Subject: Draft Environmental Assessment and Anticipated Finding of No Significant Impact: Job No. PLH-35b Kāpaia Cane Haul Road 18-inch Main, Līhu‘e Water System, Līhu‘e, Kaua‘i, Hawai‘i.

Mahalo nui for considering following comments from the Department of Hawaiian Home Lands' (DHHL) on the County of Kaua‘i, Department of Water's (KDOW) Draft Environmental Assessment and Anticipated Finding of No Significant Impact: Job No. PLH-35b Kāpaia Cane Haul Road 18-inch Main, Līhu‘e Water System, Līhu‘e, Kaua‘i, Hawai‘i, noticed on September 8, 2016 (DEA). Upon review and analysis of the DEA, DHHL believes the Anticipated Finding of No Significant Impact was inappropriate and a full environmental impact statement (EIS) should be prepared for the proposed action.

Background / Basis for Comments

DHHL assesses its interests in water development and management by considering its legal rights, duties, and privileges related to water and its projected needs for water resources, including surface water. DHHL takes these interests into account when asked to review state administrative actions that may affect its interests. DHHL's specific water needs are determined primarily based on its planning system documents.

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DHHL utilizes a three-tiered planning system to guide development and management of its land holdings for the benefit of current and future beneficiaries. The planning system includes an over-arching General Plan, a second tier of Strategic Program Plans and Island Plans (which includes Water Policy Plan (WPP)),[1] and a third tier of more specific Regional and Development Plans. These plans are available on the Planning Office pages of the DHHL website.

DHHL holds over 20,565 acres on the island of Kaua‘i. DHHL, Kaua‘i Island Plan, at 2-1 (updated Jun. 4, 2004) (KIP). DHHL has planned uses for 526 acres in Wailua, which is located nearby to the proposed project area. DHHL, Wailua Regional Plan, at 9 (Dec. 2009). The residential Wailua community project is the first priority project of DHHL's KIP. The Wailua tract includes 640 residential lots (216 acres), 47 acres of commercial lands, 20 acres of community use lands, 92 acres of Special District lands, 25 agricultural homesteads (99 acres), and 52 acres of General Agricultural lands. Wailua Regional Plan at 9; KIP at 10-3. A Water Master Plan for the proposed DHHL Wailua Subdivision was prepared by Akinaka & Associates and completed in January 2009. The water study estimated 141,000 gallons per day (gpd) will be required for the 188 single family residential units planned for Phase 1 of DHHL's Wailua development. Wailua Regional Plan at 16.

Comment #1: The DEA lacked an assessment of increased withdrawal of Wailua river surface water resources.

Analysis of environmental impacts to water resources supplying the proposed project's water storage area at Kāpaia reservoir was clearly lacking in the DEA. DEA at 8. The DEA's discussion of potential impacts to hydrological characteristics merely stated the proposed project is located in the Hanama‘ulu aquifer system area, but provided no analysis of impacts on highly relevant Wailua river surface water resources. DEA at 13-15.

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[1] *See* Hawaiian Homes Commission Water Policy Plan, adopted July 22, 2014 *available at:* http://dhhl.hawaii.gov/wp-content/uploads/2013/09/HHC-Water-Policy-Plan-140722.pdf.

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The Kāpaia reservoir receives waters from the Wailua River and other tributaries via a portion of the Hanama‘ulu ditch.[2] The surface water intake for the Hanama‘ulu ditch is located at an intersection of the South Fork of the Wailua river and the outflow from the Kaua‘i Island Users Cooperative (KIUC) hydropower systems. The KIUC hydropower system holds a lease for water diverted from the North Fork of the Wailua river. KIUC's operations divert North Fork Wailua river waters for its hydropower systems and does not return the water to the North Fork of the Wailua stream. Rather, waters diverted by KIUC appear to pass into the Hanama‘ulu ditch and other portions of the East Kaua‘i irrigation system, and then the Kāpaia reservoir. Kāpaia reservoir water is pumped to the Grove Farm Surface Water Treatment Plant (SWTP) for processing, then to an enclosed 264,000 gallon storage tank, and then sent into the KDOW transmission and distribution system that is the subject of the DEA. DEA at 8. No environmental assessment or statement was prepared for Grove Farm SWTP operations and the DEA does not refer to any such assessment.

The DEA acknowledged the proposed project would result in "increased capacity" for water delivery, yet lacked an analysis of impacts consequent to increased surface water withdrawals from the Wailua River and other sources contributing to the Kāpaia reservoir. Further, the DEA did not specifically discuss the amount of increased water delivery or withdrawals from Kāpaia reservoir. According to a summary of the Kaua‘i County WUDP Update, approximately 2 mgd of surface water goes into the Kaua‘i County Līhu‘e-Hanama‘ulu-Puhi system.[3] The Grove Farm SWTP has an "initial capacity" to deliver 3 million gallons per day (mgd) to KDOW's Līhu‘e-Hanama‘ulu-Puhi water system.[4] Based on these representations, which were lacking in the DEA itself, further assessment of the impacts of the 3 mgd surface water

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[2] *See* Dep't of Agriculture, State of Hawaii, "East Kauai Irrigation System Map 1" (Dec. 2003) *available at*: http://hdoa.hawaii.gov/arm/files/2012/12/Map1.pdf.

[3] Dep't of Water, Kaua‘i County, Kaua‘i Water Use Development Plan Update Meeting Minutes (Oct. 20, 2015) *available at*: http://www.kauaiwater.org/KWUDPMinutes_SummaryOct%202015.pdf.

[4] Grove Farm, Waiahi Surface Water Treatment Plant Website (accessed Oct. 5, 2016) *available at*: http://www.grovefarm.com/waiahi-surface-water-treatment-plant.

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withdrawals is required.

Comment #2: ***DHHL interests in water resources for its Wailua planned developments must be protected.***

DHHL considers water resource protection as one of its interests under its WPP. The Wailua river runs along the top boundary of DHHL's tract and the Hanama‘ulu ditch ends along the Kalepa Ridge, mauka of the Wailua tract.

Currently, KDOW's water system services DHHL's Wailua lands. However, due to the current shortage in water supply, KDOW cannot provide water for DHHL's future planned developments in Wailua. Wailua Regional Plan at 16. DHHL is updating its component of the State Water Projects Plan (SWPP), which presently indicates the Wailua tract's long-term potable water demand at 0.7075 mgd and non-potable demand at 0.3366 mgd. Draft SWPP at 4-13. However, these demands do not account for DHHL beneficiaries' proposed lo‘i kalo uses at the Wailua tract. Wailua Regional Plan at 26. Lo‘i kalo agricultural uses could add an additional 5 mgd to future non-potable demands.[5]

The DEA discussion of the purpose and need for the proposed project should have included more description of the uses to which the increased water delivery would be put. This information would assist DHHL in assessing whether and how public trust uses of water, including domestic uses and Hawaiian Home Land uses, would be protected.

KDOW's environmental assessment of its proposed project should include an analysis of the ways DHHL's reservation of waters from Wailua will be protected, including a water credits agreement for a portion of increased water delivery or water lease provisions, as discussed further below.

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[5] The conservative estimated water requirement for lo‘i kalo is 150,000 gpd per acre. *See* Stephen B. Gingerich, Chiu W. Yeung, Tracy-Joy N. Ibarra, and John A. Engott, "Water use in wetland kalo cultivation in Hawai‘i," USGS Open File Rpt. No. 2007-1157 (2007) *available at*: http://pubs.usgs.gov/of/2007/1157/.

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Comment #3: ***The DEA lacked discussion of a water lease or license as a "possible permit" required for its proposed water withdrawals.***

Because increased surface water withdrawal is a component of KDOW's proposed project, KDOW should be required to obtain a water license or lease for its approximately 3 mgd of surface water usage. Diverted surface waters that eventually enter the Grove Farm SWTP originate from State lands. HRS §171-58 authorizes the Board of Land and Natural Resources (BLNR) to lease rights to capture, divert, or impound water, such as those diverted from the Wailua River, impounded at Kāpaia reservoir, and captured for use by the Grove Farm SWTP. Protection of DHHL's water reservations may be accomplished through HRS §171-58(g), which requires such protections to be included in these authorized water licenses or lease agreements.[6]

Comment #4: ***The DEA lacked a Cultural Impact Assessment or a rationale for this lack.***

The State Office of Environmental Quality Control (OEQC) provides guidelines for preparing Cultural Impact Assessments (CIAs) for proposed projects that may significantly affect cultural resources.[7] The DEA contained no discussion of any cultural impacts consequent to KDOW's proposed action, and also did not provide a rationale documenting a determination that no cultural resources may be significantly affected.

While the proposed project is located in a relatively developed, urban area, that does not preclude the need for a CIA. *See* OEQC Guide at 12 ("If the subject area is in a developed urban setting, cultural impacts must still be

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[6] Such a water lease would be subject to DHHL's entitlements pursuant to HHCA §213 and article XII, section 1 of the Hawai'i State Constitution, which provides 30 percent of "state receipts derived from the leasing of cultivated sugarcane lands under any provision of law or from water licenses shall be transferred to the native Hawaiian rehabilitation fund, section 213 of the Hawaiian homes Commission Act, 1920, for the purposes enumerated in that section." Haw. Const. art. XII, §1; HHCA § 213 (1920).

[7] OEQC, Guide to the Practice and Implementation of HEPA, at 11 (Jan. 2012) *available at*: http://oeqc.doh.hawaii.gov/Shared%20Documents/Misc_Documents/Guide%20to%20the%20Implementation%20and%20Practice%20of%20the%20HEPA.pdf (OEQC Guide).

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assessed."). Also, in this case, the geographic scope of potential cultural impacts should extend to the upstream water diversion upon which the proposed project depends, and to downstream effects of reduced water supply. As discussed *supra*, Comment No. 1, surface water sources for the Grove Farm SWTP include diversions from the North Fork of the Wailua River. Upon information and belief, portions of the North Fork of the Wailua River below the diversions are drained dry. Potential impacts on water, including stream waters, as important cultural resources for Native Hawaiian traditional and customary practices should be assessed. The Wailua River State Park incorporates the Wailua Complex of Heiau, which is a National Historic Landmark. Heiau are purposefully located and several of the heiau complex were placed adjacent to the Wailua River - the Hikinaakalā Heiau, the Poli‘ahu Heiau, and the Kalaekamanu Heiau (Holoholokū Heiau). Wailua Regional Plan at 7.

DHHL beneficiaries include native Hawaiian traditional and customary cultural practitioners, whose practices include gathering, fishing, and other practices. Inclusions of information about prospective, positive significant impacts on surface waters would further assist in assessing the impacts of KDOW's proposal on DHHL interests.

Conclusion

Mahalo nui for considering DHHL's comments on the KDOW DEA. Please direct any questions to me at (808) 620-9501, or your staff may contact Kaleo Manuel in our Planning Office at (808) 620-9485 or at Kaleo.L.Manuel@hawaii.gov.

Aloha,

Jobie M. K. Masagatani, Chair
Hawaiian Homes Commission

cc: Steven B. Macklin, Kodani & Associates Engineers, LLC.

Appendix C Letter from Dr. Mehana Vaughan

College of Tropical Agriculture and Human Resources
Department of Natural Resources and Environmental Management

UNIVERSITY of HAWAI‘I
MĀNOA

Dr. Mehana Blaich Vaughan
Assistant Professor of Sustainable Watershed and Coastal Management
University of Hawai‘i at Mānoa
Department of Natural Resources & Environmental Management,
College of Tropical Agriculture & Human Resources,
1910 East-West Road, Sherman 101
Honolulu, HI 96822

October 18, 2016

Aloha mai e Kumu Kehaulani,

I am still ma‘ana with our huaka‘i to Wai‘ale‘ale and am finding it hard to put all I feel into words. I am so grateful to have seen these places and for the gracious tour by Brad Rockwell and yourself. I appreciated Brad‘s thoughtfulness and knowledge of the system and learned so much. Here are some thoughts related to the diversions of Wai‘ale‘ale water by KIUC.

Ka waiwai o Wai‘ale‘ale, ka wai kini: The beauty and power of the water, and of Wai‘ale‘ale was astonishing. The opportunity to see our mountain so close, from so many angles, to learn names of each of her tributaries, and to stand so close to Kawaikini was amazing, as was getting to dance Kaulilua, a mele composed to honor the dignity of this mountain, just there in her sight. As hula practitioners and Hawaiians we dance and chant for places, and call their names. To be able to do so in those places, and to watch their response, is so important, providing more depth and understanding to our practice, and, I believe, mana to these beloved wahi.

Wailua River North Fork: The primary issue of concern, which should be addressed immediately, is the complete drying of the north fork of the Wailua river. We are taught that water is the lifeblood of the ahupua‘a, keeping circulation healthy and carrying needed nutrients to the ocean. The image of the dry stream bread, encroached by invasive vegetation, visited by rats and cattle egrets showed an ecosystem out of balance, and a cultural harm to our reverence for water and its ability to flow. Hawaiian manowai were made to adapt to the flows of the river, to divert less water when there was lower base flow, and to give way in heavy flooding. While the current dam may divert less than 50% of the annual average stream flow when high flooding days are included, it is diverting all of the water and leaving the stream bed dry many days out of the year. The day we visited was rainy, as was the day before, yet the channel below the diversion was dry. I suggest removing the existing dam as soon as possible and devising a replacement system in which the diversion always leaves more than half of the water in the stream, never taking more than 50% of the daily flow. Perhaps lava rock could be used and not cemented, just as our kupuna built their manowai.

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Precautionary Principle and Adaptive Management:

Multiple sources state that Hawaiians never took more than half of the water from a stream channel (Nakuina, Tong 2014). However, it was much more complex than a simple figure:

> "Nakuina affirms, "no auwai was permitted to take more water than continued to flow in the stream below the dam. It was generally less, for there were those living makai, and drawing water from it, whose rights had to be regarded."[50] This meant that you always left more water in the stream than in the ʻauwai, because there was usually more than one ʻauwai on any given stream. Therefore, customary water allocation considered the water rights of everyone in the area, as well as the ecosystem within the stream" (Tong 2014).

Hawaiian ‘auwai primarily returned water back to the stream from which it was diverted, after it had flowed through the lo‘i kalo, so most diversions were not permanent removals of water from the watershed and stream channel. Because this ditch moves Wai‘ale‘ale water across multiple ahupua‘a, and as far as Koloa, I think that a more precautionary figure than just under 50% is in order, no more than 30%. In addition, with already decreasing stream flows and well levels, as well as forecasted longer periods of dry weather and more concentrated precipitation events due to climate change, leaving water in the streams to facilitate percolation and ground water recharge seems vital. Utilizing the precautionary principle also is supported and in some interpretations required by the Waiahole decision. I would argue that more important than the specific number, is identifying the purpose and value underlying native Hawaiian care management approaches and trying to emulate them. Kalo farming kupuna ‘Anakala Eddie Ka‘anana planted beds of hoio fern to filter the water from his Pālolo lo‘i before it returned to the stream. Some form of water quality monitoring could be useful to understand how temperature, turbidity and other indicators are changed by the diversions and to test water before it is removed from the system and just before it is returned.

Access with Kuleana: I felt so very lucky to stand in the places we went, awestruck by the views, and new sense of our Kaua‘i that they provided. I was cognizant as were many in our class that without KIUC‘s presence, use of the water, and hosting, without this permit application, we would not have gotten to go. It also felt wrong that so many visitors go for recreation, and because they can pay the price of admission, while so few residents are able to. To me the area needs and provides an opportunity to develop models which offer access with kuleana. For example, groups could come for educational and cultural purposes, and in exchange provide work such as hands on restoration of natives, maintenance of ditches or roads, place names and mo‘olelo research, or creation of curriculum about Wai‘ale‘ale for island schools. These are not places that should be visited by multitudes for no purpose or just for fun. At the same time they should not be closed off completely as they are such amazing sights of learning and sustenance. Also, they must take a lot to upkeep.

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Hawaiian mo‘olelo and historical accounts (Malo, Handy, Tong) describe famers and other water users working to clean auwai systems from ma kai to the source, with all users participating, and with water allocation predicated on the dedication of work to take care of it:

> "This was consistent with Nakuina's explanation, which noted that the amount of water one was allotted depended on how much labor one put into working the land. This would include how much work one contributed in the larger community projects, such as the building of an ʻauwai, and how much water one needed to irrigate the amount of lo□i s/he customarily cultivated.[53] Water was available to all, as long as s/he used it sufficiently and contributed to community projects."

How might the idea of rights to utilize and access water being predicated on contributions of care taking and responsibility apply in this case? Water was not banked, but put to beneficial use? Might allocation of Wai‘ale‘ale water be based upon public benefit. Therefore, in addition to legally protected uses like taro farming and Hawaiian homelands, other uses might receive more allocations such as production of food for local consumption vs. export, or affordable housing vs. luxury subdivisions and golf courses, or for those who work on stream restoration and enhancing the ecosystem.

Kilo and Monitoring: Managed, limited access with kuleana may also play a part in another key need we saw which was enhanced monitoring. It seemed important to have more holistic assessments of each stream‘s health from mauka to makai. On our trip we were able to see points along the way, but it seemed important to understand what happened below and above these points. For example, how much water remains in Waikoko stream after the stable storm flow ditch? There was plentiful flow the day we were there continuing on below the Waikoko diversion, but how long does that last? How are o‘opu populations in every stream? How much water remains in Waiaka, Ili‘ili‘ula, Kaulu, Palikea, Kamo‘oloa and the other tributaries diverted by the North Wailua ditch below those diversions. The two existing water flow gauges are obviously quite important. Adding more so that each stream is monitored above and before the diversions would be useful as would aerial photos or drone flights along each stream mauka to makai.

At the same time, monitoring really depends upon people, not just instruments. Most kalo farmers I have worked with make it a point to check their water source daily, and to organize their lives and tasks accordingly. Wisdom is built by observing area water sources not monthly or annually, but daily in their many moods throughout the course of a year and over many. The power plants and need to hire crews to maintain them struck me as a wonderful opportunity not simply just to hire locals but to train them in understanding of wai, applied hydrology, and the work of serving as kilo, observers, and kahu, or caretakers of the water.

Cultivating Pono: The Waiahi area and stream was so beautiful, and so different from the north fork, so full of water, moistening the air all around it. I wonder what Waiahi stream would look

like without the diversions from the north fork and other branches, part of which enter Waiahi after the power plants. What might effects on Waiahi‘s flows be if flow is restored to the north fork? At this point, and with such an extensive system of diversions, what is the natural state of the ‘āina and resource?

The ditch systems are magnificently designed and completely staggering to imagine building and engineering. I would not advocate ending their diversion of water completely or destroying these systems which so many hands and kino gave so much to construct. I did not hear hardly anyone on our trip say that they felt all of the water should stay in the streams, but that there is a need for balance, and for re-balancing, particularly in the case of the north fork.

It seems there is plenty of water. I appreciate that the power plant water returns so quickly to the stream, though it is diverted again not far from the power plants, another area it was impossible to assess without seeing. The areas where the water returns appear healthy and un-impacted by its use for hydro. The answer seems not all or nothing, but a more balanced distribution which always responds to the changing ecosystem and human needs without simply assuming current states of diversion, consumption, or land ownership. Water should not be diverted simply to be banked.

Consumption as a Core Cause: Because the hydro only provides 1% of Kaua‘i‘s power, it does not seem essential to have this use, nor does the use seem to be detrimental. Seeing it made me wish that our co-op would start to think in terms of more distributed systems, because smaller decentralized hydro, solar, and wind systems, in which neighborhood or household power was provided locally, could transform energy provision on our island, and reduce the need for the current fuel burning plant which provides 80% of current energy needs. The whole trip made us think about limits and needs, and the importance of knowing where our water and power come from, being cognizant of how we use these precious resources, and using less. I felt, that, though KIUC may not need the hydro-power to meet Kaua‘i‘s energy needs, I am grateful the utility is there to connect all of us co-op owners as a community to this water. Their presence makes us all collectively responsible, dependent, and provides a means of connecting to and taking responsibility for our use of the resource which would likely not exist without them.

Cultivating Ecosystem Health:

I have not seen extensive studies of o‘opu and wī in the area, and I know that these have not been done for all of the streams. In the north fork, my understanding is that there are no o‘opu above the diversion. This is a violation of state law, and most unfortunate. Rather than meeting the lowest possible standard of having o‘opu present, we should turn to stories of Kaua‘i kūpuna who, as recently as the 70s recall streams black with o‘opu, every species, nākea and alamo‘o large enough to fit an adult‘s fist in their mouths. Such images of abundance should inspire efforts to restore it, so that our children will not only see o‘opu but see healthy populations of many fish reaching their most productive size classes. Let us work for a time when it is appropriate to consume these fish once more, and when young people our familiar with their life cycles and patterns. The famous waters of Wailua, the largest river on Kaua‘i and

in much of Hawai‘i are a critical place for restoration not only of o‘opu but of wī and ‘opae, of pīnao and other species which are not eaten but indicate ecosystem health, and for cultivating true abundance.

Could there be systems of rotational diversions for some of the streams? Perhaps some water (an amount far less than 50% which depends upon studies of the amount of flow required for optimal health of stream life) from Waikoko and Ili‘ili‘ula streams could be diverted, then switch to Waiahi and Waiaka. In this way, no stream would be even partially diverted all of the time, but all would have times of heavier and lighter flow. This is similar to how neighboring ahupua‘a fisheries took turns closing species, allowing residents in the closed area to harvest from the next ahupua‘a, then switching to rest the species where it had been harvested, so that both could have times to replenish.

Another key issue is the need to consider the entire ecosystem holistically, as our kūpuna did, mauka to makai, from the forests to the sea, from Kawaikini and the peak of Wai‘ale‘ale to Ka‘iwa. Research with indigenous peoples worldwide emphasizes that resources, were sources, considered not only connected to and a part of human communities, but also linked to one another. Contemporary management focuses on forests as if they were distinct from streams, aquatic resources as distinct from aquatic recreation, and individual diversions, ditches and pipes individually instead of as an interconnected system of cumulative impacts. Cumulative impacts assessment is one of the most difficult and ignored areas of environmental management, however, considering every diversion, historic and existing, on every tributary, together as a whole system, is crucial to achieving the holistic ecosystem-based approach of our kūpuna.

Pani: In conclusion, complete dewatering of the north fork of the Wailua stream is of utmost concern and water must be restored immediately. In addition to violating legal precedent in Hawai‘i protecting water as a public trust resource and requiring maintenance of some level of in-stream flow, dewatering is a cultural violation out of keeping with customary approaches to water management and with cultural standards of reverence for wai. The stream without water is a dramatic and disturbing site, as is the predominantly invasive vegetation lining the empty stream bed in contrast to the presence of more native forest on the other Wai‘ale‘ale branches which maintain water flow. Further the waters of Wai‘ale‘ale are magnificent beyond imagining. It is vital to find ways to engage responsible community members in further learning about these places and systems, in efforts to help care for them, to conduct ceremony, visit, monitor, and participate in working towards more balanced approaches to mālama all of these waters.

Mahalo a nui loa for engaging and sharing with us. We are forever changed as individuals and as a class. All of our students returned to class Monday wide eyed, full of questions, moved, staggered, and amazed by our day. Mahalo pālena ‘ole. Please feel free to contact me if I can be of further assistance.

‘O au iho no me ke aloha nui,

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With sincerest aloha,

Dr. Mehana Blaich Vaughan
Department of Natural Resources and Environmental Management,
UH Sea Grant College Program & Hui ‘Āina Momona

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Appendix D Senate Bill No. 223

DAVID Y. IGE
Governor

JOSH GREEN
Lt. Governor

PHYLLIS SHIMABUKURO-GEISER
Chairperson, Board of Agriculture

GLENN K. MURAKAMI
Deputy to the Chairperson

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TESTIMONY OF PHYLLIS SHIMABUKURO-GEISER
CHAIRPERSON, BOARD OF AGRICULTURE

BEFORE THE HOUSE COMMITTEE ON AGRICULTURE

MARCH 20, 2019
9:00 A.M.
CONFERENCE ROOM 312

SENATE BILL NO. 223 SD2
RELATING TO IRRIGATION

Chairperson Creagan and Members of the Committee:

Thank you for the opportunity to testify on Senate Bill 223 SD2. This bill transfers operation authority over the portions of the East Kauai Irrigation System to the Department of Agriculture, establishes positions, and makes appropriations. The Department of Agriculture supports this measure provided it does not impact the priorities listed in the Executive Budget and respectfully requests the appropriated sums for general obligation bonds and general funds shown in Senate Bill 223 SD1 are included in this bill.

This bill provides much needed support for a system that has been operated and maintained by volunteer farmers in East Kauai for many years. The need for continued irrigation access for farmers in the region is of utmost importance and directly supports the State's goal to double local food production.

Thank you for the opportunity to testify on this measure.

The life of the land is perpetuated in righteousness

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6962
Fax: 808-245-3277

March 18, 2019

TO: **Committee on Agriculture**
Rep. Richard P. Creagan, Chair
Rep. Lynn DeCoite, Vice Chair

RE: **Testimony on SB223 SD2, Relating to Irrigation**
Wednesday, March 20, 2019, 9:00 AM, Conference Room 312

Chairperson Creagan and Members of the Committee:

My name is Jerry Ornellas and **I strongly support SB223 SD2**. I am the president of the East Kauai Water Users' Cooperative which has managed the State-owned reservoir and ditch system in the Kapaa/Kalepa area for the past 17 years under a year-to-year revocable permit from the Department of Land and Natural Resources. On September 20, 2016, the Cooperative was informed by DLNR that as a consequence of the East Maui irrigation decision we would have to seek a long-term water lease. We were given three years to complete the application process which includes an Environmental Impact Statement which alone is beyond our monetary resources to pay for, as well as other complex requirements. Even if we had the resources to pay to meet the requirements, we could only bid on the system at public auction with no guarantee that we would ultimately be awarded a lease for the system.

Once the three years expires at the beginning of 2020, DLNR will no longer renew the system's revocable permit, the Coop will cease operation, the irrigation system, including the recently renovated Wailua and Upper Kapahi Reservoirs, will revert to DLNR control (including dam safety oversight) and most likely be abandoned. In 2001, ITC Water Management, hired by the State to evaluate the East Kauai system, estimated the cost to build it in 2001 to be in excess of $200 million. We are talking about the potential loss of a substantial and irreplaceable State asset.

We are therefore in favor of SB223 SD2 allowing the East Kauai system be taken over by the Department of Agriculture. This is in keeping with the mandate of Article XI, Section 3, of the State Constitution: "The state shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands."

Furthermore, Hawaii Revised Statue 167-1, Irrigation Water Development, states: "Findings and declaration of necessity. It is important to the welfare of the people of Hawaii that agricultural production be developed as fully as possible. **It is further found that water presently tapped for irrigation is inadequate for the fullest development of the economy of the State.** It is therefore hereby declared that additional water and water facilities are neces-

sary for the development of agriculture in the State."

The statue recommends development of new water facilities, what to say of preserving the ones we already have.

In 2003, the Department of Agriculture released its comprehensive Agricultural Water Use and Development Plan which analyzed the development and present status of State's plantation-developed irrigation systems and concluded that the East Kauai System was among five State systems "important and viable to Hawaii's growing diversified agricultural industry." **This study states, on page 37, that the EKWUC management of the system is intended only on "an interim basis" pending the transfer of the irrigation system from DLNR to HDOA as required by Act 90, SLH 2003.**

Our system includes two reservoirs and 22 miles of ditch which has historically serviced thousands of acres of State and private lands. In particular, it can supply irrigation water to more than 1,000 acres of the State Kalepa lands located between Kapaa and Lihue, and a similar amount of private former cane lands mauka of Kapaa town. When first taken out of sugar cane in 2001, the Kalepa lands had gone into pasture, but in the last few years, through the good action of the Agribusiness Development Corporation, nearly 300 acres to date has been leased to farmers who are actively developing their crops, including ginger, bananas, noni and sweet potatoes. This is only possible because the Coop can provide these farms with water.

Aside from the State lands and private Kapaa parcel, the Coop system can service thousands of acres of so-called "marginal lands"—those not taken by the cane companies and now privately owned. These are located throughout Kapaa and are or could be productive agricultural lands, such as my own farm.

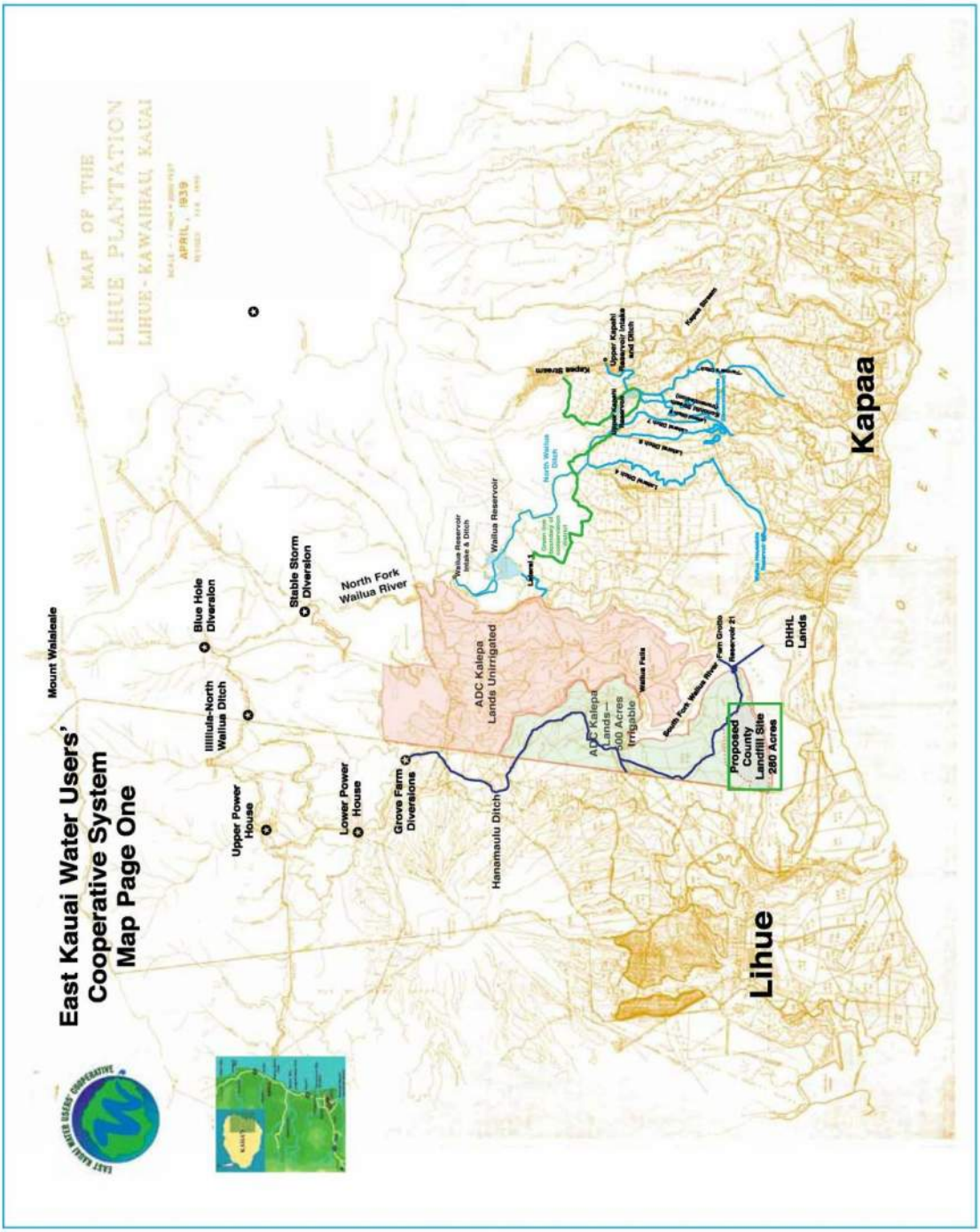
The Department of Agriculture is the natural State agency to manage this public water system, as is the pattern in most other states in the country. It is also the only long-term, permanent way to manage the system for the benefit of our citizens.

I respectfully ask that you pass this bill.

East Kauai Water Users' Cooperative

Jerry Ornellas

Jerry Ornellas, President


East Kauai Water Users' Cooperative System Map Page One
MAP OF THE LIHUE PLANTATION LIHUE - KAWAIHAU, KAUAI
APRIL, 1939
Mount Waialeale
Blue Hole Diversion
Stable Storm Diversion
North Fork Wailua River
Iliiliula-North Wailua Ditch
Upper Power House
Lower Power House
Grove Farm Diversions
Hanamaulu Ditch
ADC Kalepa Lands Unirrigated
ADC Kalepa Lands— 400 Acres Irrigable
Wailua Reservoir
Wailua Reservoir Intake & Ditch
North Wailua Ditch
Wailua Falls
South Fork Wailua River
Farm Grove Reservoir #1
Proposed County Landfill Site 280 Acres
DHHL Lands
Kapaa Stream
Upper Kapaa Reservoir Intake and Ditch
Kapaa Stream
Lihue
Kapaa
O C E A N

HAWAI'I FARM BUREAU

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e-mail info@hfbf.org; www.hfbf.org

March 20, 2019

HEARING BEFORE THE
HOUSE COMMITTEE ON AGRICULTURE

TESTIMONY ON SB 223, SD2
RELATING TO IRRIGATION

Room 312
9:00 AM

Aloha Chair Creagan, Vice Chair DeCoite, and Members of the Committee:

I am Brian Miyamoto, Executive Director of the Hawaii Farm Bureau (HFB). Organized since 1948, the HFB is comprised of 1,900 farm family members statewide, and serves as Hawaii's voice of agriculture to protect, advocate and advance the social, economic and educational interests of our diverse agricultural community.

The Hawaii Farm Bureau strongly supports SB 223, SD2, which transfers operational authority over the portions of the east Kauai irrigation system operated and maintained by the east Kauai water users' cooperative to the department of agriculture, establishes positions within the agricultural resource management division, and authorizes GO bonds for plans, designs, land acquisition, and equipment.

Since the demise of plantation operations across the islands, we have seen the erosion of irrigation systems. Ditches that carried water fell into disrepair with major leaks in the system, and in cases such as Kau, cracks in tunnels created enough losses that there is no longer significant flow of water. The Legislature continues to advocate for increased self-sufficiency and sustainability. Agriculture must play a key role in the process and for there to be agriculture, water is important.

The East Kauai Irrigation System services more than 12,500 acres of agricultural land on Kauai. The repair and maintenance of this 21-mile irrigation systems is critical for Kauai's farmers who depend on the East Kauai Irrigation System for their operations. Water availability is a basic necessity needed by farmers and ranchers to maintain and expand their production, particularly in times of drought. Having a reliable water supply is a key factor when Hawaii's farmers and ranchers are making decisions to start new or to expand existing operations.

Thank you for this opportunity to testify on this important matter.

SB-223-SD-2
Submitted on: 3/18/2019 2:55:03 PM
Testimony for AGR on 3/20/2019 9:00:00 AM

Submitted By	Organization	Testifier Position	Present at Hearing
Dale Sandlin	Hawaii Cattlemens Council	Support	No

Comments:

LARRY JEFTS FARMS, LLC
PO BOX 27
KUNIA, HAWAII 96759
(808) 688-2892

SB223sd2, Relating to Irrigation
Hse AGR Hearing
Wednesday, March 20, 2019
9:00 am
Conference Room 312

Testimony by: Larry Jefts
Position: Support

Chair Creagan, and Members of the House AGR Committee:

I am Larry Jefts, owner and operator of Larry Jefts Farms, LLC, which is part of our family-run business of farms on Oahu and Molokai, under the administrative umbrella of Sugarland Growers, Inc. We have more than 35 years of Hawaii farm experience on Molokai and Oahu. I am a volunteer director for the West Oahu Soil and Water Conservation District (SWCD).

Water is the lifeblood of all farmers and without affordable and accessible water there will be no farming. No farming, no locally grown produce and livestock.

For more than 17 years, the East Kauai Water Users' Cooperative has managed the State-owned reservoir and ditch system in the Kapaa/Kalepa area under a year-to-year revocable permit from the Department of Land and Natural Resources (DLNR).

I understand that the Cooperative was informed by DLNR that within 3 years an application process to include an Environmental Impact Statement is needed. This far exceeds the Cooperative's monetary resources and capacity for other complex requirements.

Your support and passage of SB 223sd2 is critical because of the timing of the expiration of the 3 year application process period, at which time DLNR will no longer renew the revocable permit. This means the Cooperative will cease operation; the irrigation system will revert to DLNR control where attention for this issue may be lost among its diverse priorities. The Department of Agriculture is the appropriate state agency to manage this responsibility.

Thank you for the opportunity to present testimony

The life of the land is perpetuated in righteousness

Kalepa Koalition
5868 Kini Place
Kapaa, Hawaii 96746
Phone/Fax: 808-639-0152

March 18, 2019

TO: **Committee on Agriculture**
Rep. Richard P. Creagan, Chair
Rep. Lynn DeCoite, Vice Chair

RE: Testimony on SB223 SD2, Relating to Irrigation
Wednesday, March 20, 2019, 9:00 AM, Conference Room 312

Chairperson Creagan and Members of the Committee:

We **strongly support SB223 SD2**. The Kalepa Koalition is a Hawaii agricultural cooperative of the farmers and ranchers who hold long-term licenses on 6,500 acres of State land behind Kalepa Ridge on Kauai and under the administration of ADC.

The East Kauai Water Users Cooperative System can presently service more than 1,000 acres of the Kalepa lands. In just the last few years, ADC has converted nearly 300 acres of irrigable land from ranching to farming, and has more prospective farmers under consideration.

All this progress toward food self-sufficiency will be reversed if the Coop system is not put under the Department of Agriculture before its Revocable Permit expires in 2020, as called for in the 2003 DOA study of Hawaii's water systems and Act 90, SLH 2003.

We respectfully request that this bill be passed.

Leslie P. Milnes, President
Kalepa Koalition

Acharya Arumugaswami

Acharya Arumugaswami
Member, Board of Directors

Saiva Siddhanta Church
Kauai's Hindu Monastery
107 Kaholalele Road
Kapaa, Hawaii 96746-9304•USA
Phone: (808) 822-3012

March 18, 2019

Committee on Agriculture
Rep. Richard P. Creagan, Chair
Rep. Lynn DeCoite, Vice Chair

Testimony on SB223 SD2, Relating to Irrigation
Wednesday, March 20, 2019, 9:00 AM, Conference Room 312

Chairperson Creagan and Members of the Committee:

We **strongly support SB223 SD2**. We are a founder member of the East Kauai Water Users' Cooperative Board of Directors which maintains 22 miles of ditch and several reservoirs in and around Kapaa. It also service more than 1,000 acres of State lands located in Kalepa and potentially could service nearly the entire 6,500 acres of Kalepa.

We urgently request the committee to approve this legislation. On September 20, 2016, the East Kauai Water Users Cooperative was given three years by the Department of Land and Natural Resources to apply for and receive a water license for the system. The application process requires an environmental impact statement, the cost of which is far beyond the Coop's means.

Once the three years passes at the beginning of 2020, the system will revert to DLNR who most likely will abandon it. Therefore, this bill is urgent. Session Law Act 90 of 2003 specifically calls for agricultural lands, including their irrigation systems, to be from DLNR to DOA.

This will ensure the long-term preservation of this valuable system—estimated by State consultants to be worth "more than two hundred million dollars"—in service of local farmers and ranchers.

Saiva Siddhanta Church

Sadasivanatha Palaniswami
Vice-President, Saiva Siddhanta Church

SB-223-SD-2
Submitted on: 3/19/2019 8:57:47 AM
Testimony for AGR on 3/20/2019 9:00:00 AM

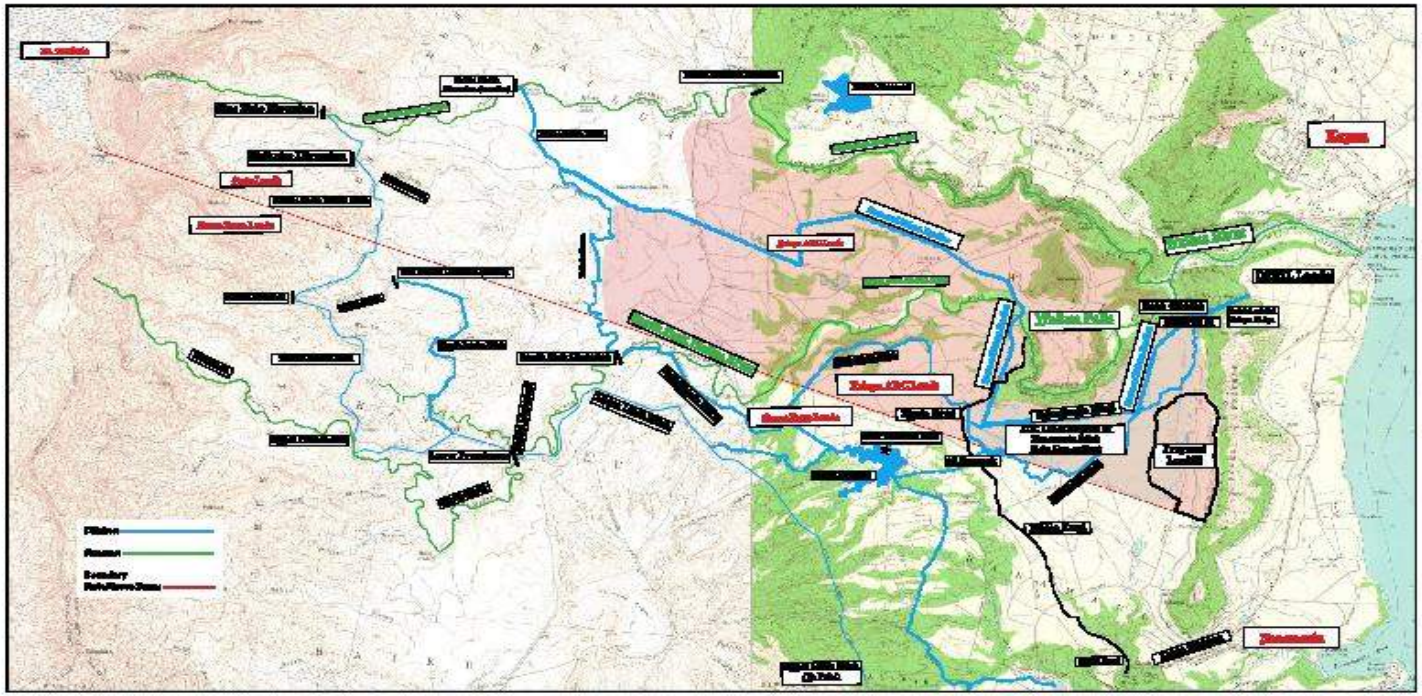
Submitted By	Organization	Testifier Position	Present at Hearing
J Ashman	Individual	Support	No

Comments:

Please support our Kauai small farmers who desperately need this legislation to pass!

Thank you.

Appendix E White Paper Kalepa Lands



Ditch Systems Related to the ADC Kalepa Lands, Kauai

The life of the land is perpetuated in righteousness

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6982
Fax: 808-245-3277

White Paper

Blue Hole Diversion and East Kauai Ag Lands

Summary:
The discussions to date regarding the KIUC application to divert water at Blue Hole and Waikoko Streams for power production fail to encompass the impact on existing irrigation systems on State Kalepa lands downstream of the power houses. No proposal being put forth ensures the continued operation of this system servicing hundreds of acres of prime ag land, and being necessary for the supply of water to the adjacent DHHL lands.

Explanation:
The East Kauai Water Users Cooperative holds a Revocable Permit from DLNR for the Hanamaulu Ditch on the ADC administered "Kalepa Lands" between Lihue and Kapaa and behind Kalepa Ridge. Hanamaulu Ditch is capable of irrigating about 800 acres of the prime farming area of these lands, of which 300 are presently being farmed. In addition, the Coop supplies water via Hanamaulu Ditch to Reservoir 21 and through a tunnel to the DHHL lands to the east of Kalepa Ridge and adjacent to Kuhio Highway.

The Hanamaulu Ditch originates at a diversion where the Waiahi and Waikoko Streams meet on Grove Farm land to form the South Fork of the Wailua River. The diverted water includes the natural stream flow, water from the Blue Hole and Waikoko diversion on State land, and numerous diversions on Grove Farm land.

The ditch flows on Grove Farm land for about a mile, in the process providing water to Kapaia Reservoir and ag lands along the way, before entering the ADC Kalepa Lands. The Coop has an agreement with and pays Grove Farm $1800 yearly to convey water to Hanamaulu Ditch. The ditch flows for some distance on the ADC land at an elevation lower than most, but not all, of the adjacent fields. Once it crosses Maalo Road it becomes able to irrigate about 800 acres of the ADC lands, plus the DHHL lands.

The study by the Commission on Water Resource Management of the Blue Hole and Waikoko diversions largely overlooks the Hanamaulu Ditch and the likely consequences of a changes in the Blue Hole and Waikoko diversions upon the ADC lands. The impact on the DHHL lands was mentioned, but not in the context of how the diversion and conveyance of water to those lands was going to be possible without Grove Farm operating the diversion and first mile of the ditch and the Coop operating the remaining ditch until Reservoir 21.

Action Requested:
The present deliberations regarding the KIUC water license must take into account the continued supply of water to the State ADC Kalepa lands. A failure to do so will not only leave hundreds of acres of prime ag land without irrigation potential, but likely make impossible the conveyance of water to the DHHL lands at the end of the existing system.

December 3, 2018

The life of the land is perpetuated in righteousness

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6982
Fax: 808-245-3277

Dec. 11, 2018

TO: Suzanne Case, Chair
Board of Land and Natural Resources
State of Hawaii

RE: **Coop Water RP Renewal with regard to DHHL Reservations**

Aloha Chairperson Case:

As detailed in the staff submittal for item D-13, it is expected that legislation will again be introduced this session for the Department of Agriculture to take over management of the East Kauai irrigation system which includes Wailua Reservoir and Upper Kapahi Reservoir. The Coop is vigorously working to get this legislation passed.

In addition to East Kauai, the Coop services the ADC "Kalepa lands" behind Kalepa ridge utilizing the Hanamaulu Ditch. The CWRM staff reports and meetings regarding KIUC's Blue Hole diversion permit have not to date encompassed the service of water to these ADC lands, but only discussed Hanamaulu Ditch in terms of water reservations for the DHHL lands at the very end of the system (reservations we fully support).

Presently water in the South Fork is diverted on Grove Farm land into the Hanamaulu Ditch. It is first utilized by Grove Farm, then the ADC lands and finally, through Reservoir 21, the DHHL lands—see attached map to understand this complex system.

If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question—a key issue which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamaulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process.

Jerry Ornellas
President, East Kauai Water Users Cooperative

Attachments: Water system map; EKWUC white paper

APPENDIX F
Socioeconomic Impact Assessment

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Established 1960
Beyond Information. Intelligence

Waiahi Hydropower Project Socioeconomic Impact Assessment

Database Marketing

Economic & Social Impact Studies

Evaluations

Research Modeling/Forecasting

Prepared by SMS for:

SSFM INTERNATIONAL

May 2019

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PROJECT BACKGROUND

The Kaua‘i Island Utility Cooperative (KIUC) is undertaking an Environmental Assessment (EA) in support of their water lease application for continuing with two diversions on state land: the North Fork and Waikoko Diversions. KIUC has been operating and maintaining the two diversions and the ‘Ili‘ili‘ula North Wailua Ditch System through a Revocable Permit (RP) issued by the Board of Land and Natural Resources (BLNR). The ditch system and associated diversions deliver water to the Waiahi Hydropower Plants, which provides renewable energy for the island of Kaua‘i. Water is discharged from the hydropower plants into Waiahi Stream supplementing natural stream flow in the South Fork Wailua watershed available for irrigation, county drinking water, recreation, and other commercial purposes in the Līhu‘e and Wailua areas. SSFM is conducting an Environmental Assessment (EA) and has contracted with SMS to undertake the Social and Economic Assessment (SEA) section of the EA.

The ‘Ili‘ili‘ula North Wailua Ditch System traverses both state and private land. The North Fork and Waikoko diversions and the upper portion of the ditch system are on state land. The lower portion of the ditch system, the third primary diversion on the system (the ‘Ili‘ili‘ula Diversion), and the hydropower plants are located on private land. The water lease application may be reviewed by multiple agencies including the State Commission on Water Resource Management (CWRM), the State Division of Forestry & Wildlife (DOFAW), Department of Hawaiian Home Lands (DHHL), Office of Hawaiian Affairs (OHA), the US Fish & Wildlife Service, and Army Corps. If a water lease is granted, it would be subject to interim instream flow standards (IIFS) set forth by CWRM and the water reservation for DHHL as approved by CWRM.

SMS Research & Marketing Services, Inc. conducted this socioeconomic assessment to identify the potential social and economic impacts of the Waiahi Hydropower Water Lease request. The project involves a water lease application for the North Fork and Waikoko diversions and portions of the associated ‘Ili‘ili‘ula North Wailua Ditch System. Kaua‘i Island Utility Cooperative (KIUC) uses the diverted water to operate the Upper and Lower Waiahi hydropower plants, which generate roughly 1.5 megawatts of electricity. The Waiahi plants have been in operation for nearly a century, originally built by Līhu‘e Plantation Company for their sugar operations.

These plants are the most cost-effective source of energy on Kaua‘i and their continued operation eliminates the need for approximately 675,000 gallons of diesel each year. KIUC currently operates the North Fork and Waikoko diversions under regulation from the State Department of Land and Natural Resources (DLNR), (a revocable permit). Water is discharged from the hydropower plants into Waiahi Stream where it supplements natural stream flow for downstream uses including agriculture throughout Wailua and Līhu‘e, county drinking water supply, recreation, and other commercial applications such as irrigation for the grounds of the county courthouse, Kaua‘i Community College, and the airport.

With a long-term water lease KIUC will continue to make investments in the infrastructure of the diversions, ditch system and hydropower plants to ensure efficient and cost-effective ongoing operations. Without a water lease KIUC will not be able to utilize the North Fork and Waikoko diversions, which would significantly reduce the production of both hydropower plants. It is unlikely KIUC will continue to operate the hydropower plants without a water lease granting the use of these two diversions on state land.

The objectives of this socioeconomic assessment are to:

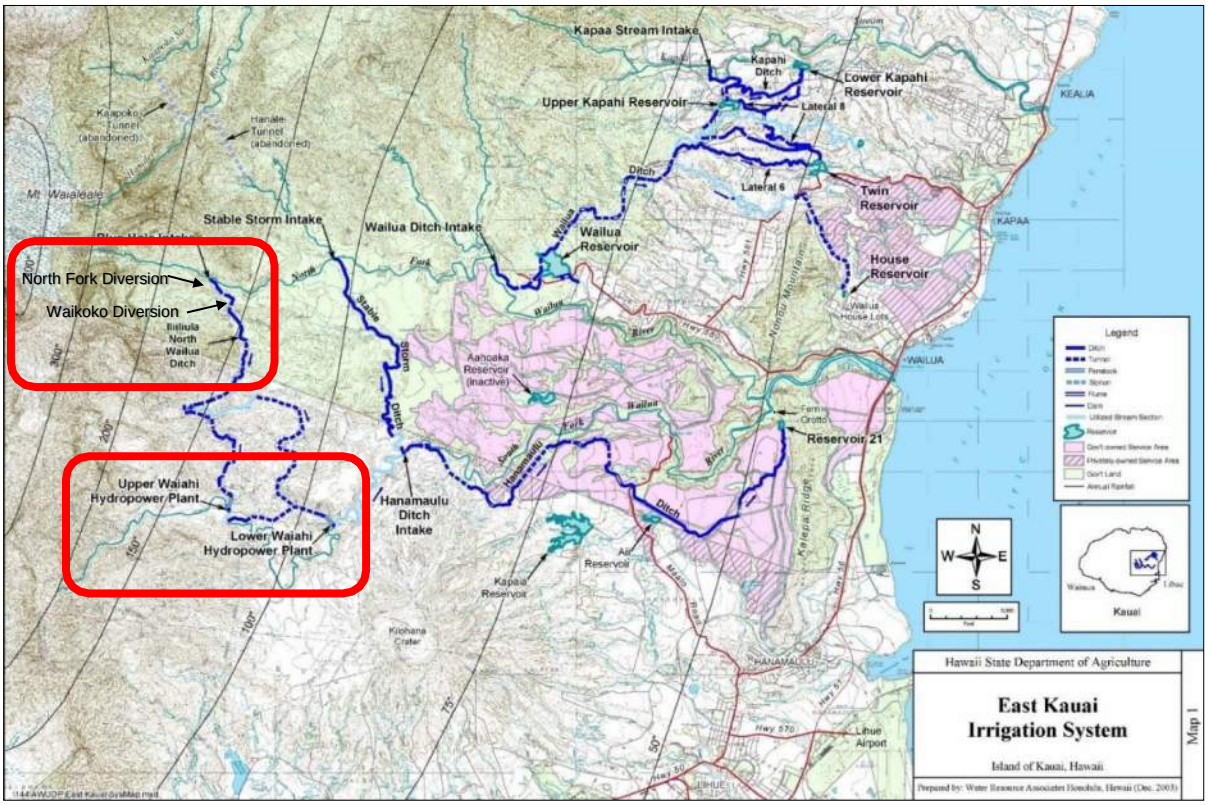
1. Describe the social and economic conditions of the community;
2. Identify potential social and economic impacts of a water lease or lack thereof; and
3. Identify actions that can mitigate any potential negative impacts.

© *SMS*

WAIAHI HYDROPOWER PLANT LOCATIONS

The Upper and Lower Waiahi Hydropower Plants are located in the southeastern region of the Island of Kaua‘i. The North Fork and Waikoko Diversions, which are the subject of the water lease application, are located in the Līhu‘e – Kōloa Forest Reserve in the Wailua area. Figure 1 below shows the location of the diversions and the hydropower plants.

Figure 1. North Fork and Waikoko Diversions, and Upper and Lower Waiahi Hydropower Plants, Island of Kaua‘i, 2018



There are two main outcomes for this project:

- Receive a long-term water lease and continue to use the North Fork and Waikoko diversions to produce hydroelectric power meeting IIFS standards with infrastructure improvements; or
- Discontinue use of the North Fork and Waikoko diversions and end operations of the hydropower plants. In this scenario the diversions and associated ditch system would revert back to DLNR and become the responsibility of the state.

SOCIAL IMPACT ASSESSMENT

INTRODUCTION

The continued operation of the diversions and hydropower plants and construction associated with the diversion modifications would affect the communities within the greater Līhuʻe area and the energy produced for the entire island. Current social and economic conditions make up the original conditions against which impacts must be measured. KIUC is currently operating the diversions and hydropower plants, which will be factored into original conditions. This section provides a description of the site, demographic and housing characteristics of host communities, and economic conditions in the area.

STUDY AREA

This Social Impact Assessment (SIA) considers two overlapping communities—the total political or geographic area affected by the proposed action (the County of Kauaʻi) and the neighborhoods nearest the proposed project site and impacted most directly by the project (Southeast Kauaʻi, including Līhuʻe, Hanamāʻulu, Wailua, and Kapaʻa). The proposed project will have different but overlapping impacts on those two communities, and both should be considered.

The Island of Kauaʻi

The island of Kauaʻi is geologically the oldest of the major Hawaiian Islands, the westernmost of Hawaiʻi's four counties, and demographically the fourth most populated island after Oʻahu, Hawaiʻi, and Maui. According to the 2016 American Community Survey (ACS 2016), the estimated population of the island was 70,447, which is a 7.6 percent increase from the 2010 U.S. Census. At 12 percent, population growth between 2000 and 2010 was slightly lower than in the prior decade (13% between 1990 and 2000). The most recent population projection (DBEDT 2040) suggests that population growth may slow somewhat to 11 percent per decade between 2010 and 2030.

As Kauaʻi grew over the last decade, its population became older and the ethnic mix changed. The population segment made up of children under the age of 18 decreased slightly between 2010 (23.1%) and 2016 (22.3%). Since 2010, the population aged 20–35, the larger part of the child-bearing segment, remained essentially the same (17.2% in 2010 v. 17.5% in 2016). The percentage of adults aged 35 to 59 accounted for one-third of the population in 2016, up slightly from 32 percent in 2010. Kauaʻi's senior population (60 and older) accounted for one-quarter (24.9%) of the resident population in 2016, up from just 20.5 percent in 2010. Birth rates have been falling since 1985, and Kauaʻi's rate of births per thousand residents in 2016 (12.4) is the lowest rate ever recorded for the island. Death rates have also been dropping, perhaps reflecting improved health care over the last several decades. Kauaʻi's rate of deaths per 1,000 residents in 2016 was just 7.9. With a falling birth rate and a stable death rate, any new population growth in the near future will depend on net in-migration.

Since 2010, the ethnicity of the people of Kaua‘i has changed very little[1]. There has been a slight increase in the percentage of Asian residents (+1.0%) and a slight decrease in the percentages of White (-0.8%) and Native Hawaiian or Other Pacific Islanders (-0.2%).

The number of households on Kaua‘i rose from 20,183 in 2000 to 23,240 in 2010, an increase of 15.1 percent. Between 2010 and 2016, the number of households increased by 7.7 percent to 25,017. That was slightly higher than the rate of increase for the population. Correspondingly, the average household size dropped slightly from 2.89 to 2.88.

Kaua‘i’s total housing units increased by approximately 5,200 units (+20.4%) between 2000 and 2010. From 2010 to 2016, roughly 2,405 units were added on Kaua‘i (+7.9%). The number of housing units available for residential use grew by 7.2 percent from 2010 to 2016. This suggests that the island’s housing stock grew slightly slower than the population in the years between 2010 and 2016. This corresponds to the opinions of Kaua‘i residents and real estate agents who indicated that the number of housing units available to Kaua‘i residents was lower in 2016 than in 2010, resulting in lower inventories and higher rents. Contributing to the shortage of available units was the increase in the number of seasonal units, which grew 5.1 percent to 5,353 units in 2016. The 2016 homeowner vacancy rate was 1.0 percent, down from 1.8 in 2010 and 1.2 in 2000. The 2016 rental vacancy rate was 16.8 percent, notably higher than the rates of 12.3 in 2010 and 6.1 in 2000.[2]

The State of Hawai‘i’s population forecast data (DBEDT 2040) predicts continued growth over the next 20 to 30 years. The annual rate of population growth is expected to remain approximately 1.2 percent. The population growth rate, however, was projected to steadily decrease from 17 percent in this decade, to 9 percent in the 2020s, and 7.6 percent in the 2030s. Certain segments of the population, however, such as older residents, are forecast to increase faster over the next 10–15 years.

Table 1. Population Forecast, County of Kaua‘i, 2010-2040

			2010	2015	2020	2025	2030	2035	2040
Resident population	Total		67,226	71,380	75,640	80,000	84,380	88,730	93,020
	0–4 years		4,337	4,700	5,020	5,400	5,770	6,140	6,500
	School-age children	5–11 years	5,876	6,210	6,660	7,130	7,640	8,160	8,680
		12–13 years	1,608	1,710	1,820	1,960	2,080	2,240	2,380
		14–17 years	3,285	3,370	3,580	3,800	4,070	4,340	4,650
	18–64 years		42,026	42,560	42,620	43,100	44,390	46,390	48,950
	65 years and older		10,095	12,830	15,940	18,620	20,430	21,470	21,870
Average daily visitor census			16,126	18,160	18,880	19,770	20,640	21,440	22,210
De facto population			83,352	89,540	94,520	99,770	105,020	110,170	115,230

Source: DBEDT Projections 2040, Kaua‘i General Plan Update 2040

Kaua‘i’s visitor population is expected to grow at rates similar to that of the resident population

1 Based on persons who reported being of one race only during the 2016 census, who comprised approximately 79.2% of Kaua‘i’s population

2 High rental vacancy rates reported by the U.S. Census may have been affected by the number of residential rentals that were being used by visitors in 2016.

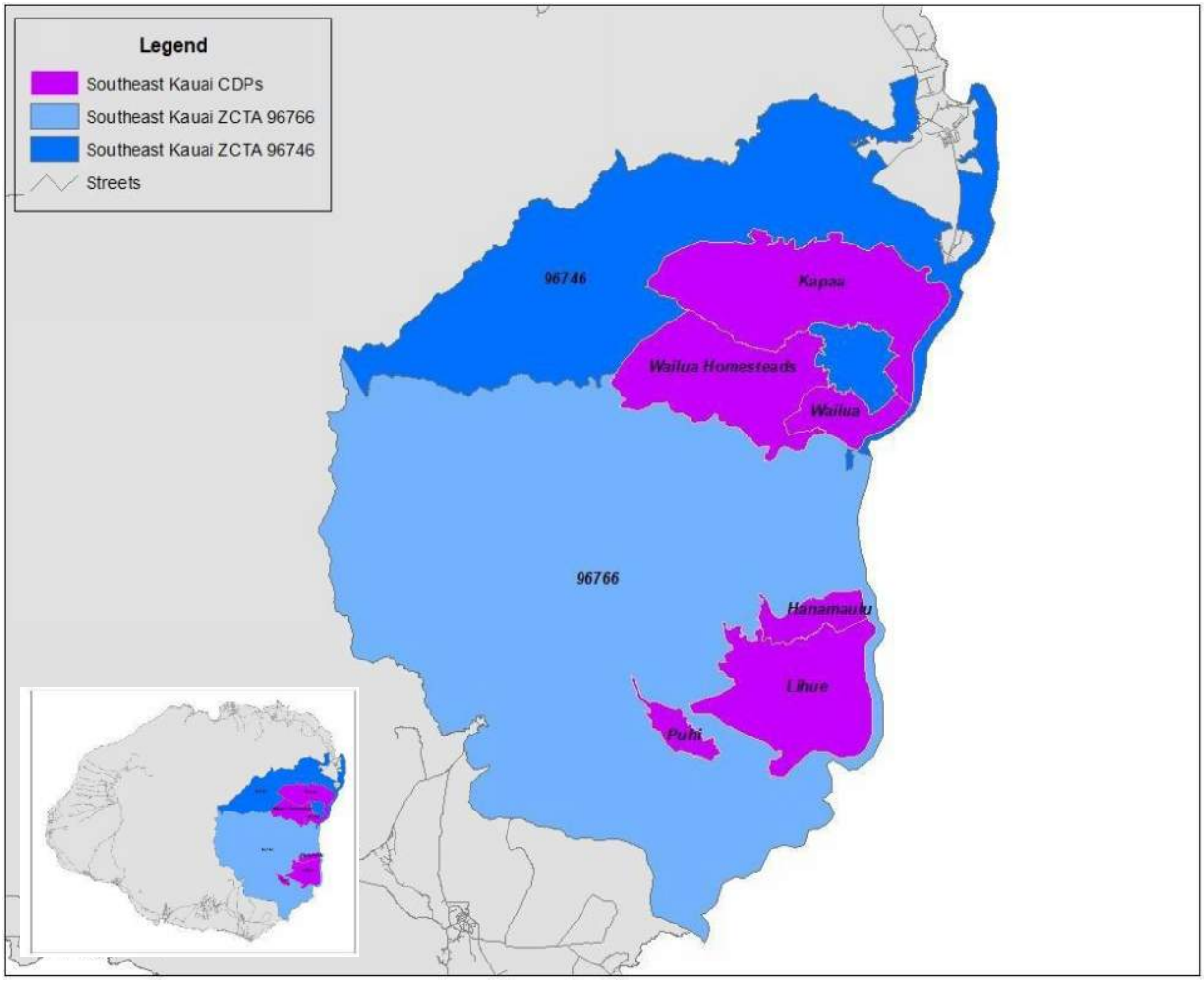
(DBEDT 2040). Total growth from 2010 through 2040 is expected to be approximately 38 percent. The growth rate for the average daily visitor census is expected to be between 10 and 13 percent per decade between 2010 and 2040.

Population forecasts for the next few decades show continued growth of population and housing needs on the island of Kaua‘i. Businesses/jobs will increase to meet the needs of the growing visitor numbers and the community. This increase in households and businesses will inherently increase the overall energy needs of the island.

Southeast Kaua‘i

For the purposes of this study, Southeast Kaua‘i refers to the region of the Island of Kaua‘i near the towns of Līhu‘e, Hanamā‘ulu, Wailua, and Kapa‘a[3].

Figure 2. Southeast Kaua‘i and the Island of Kaua‘i, 2018



[3] The area is defined as the 96746 and 96766 zip code tabulations areas (ZCTAs).

DEMOGRAPHICS AND HOUSING

Southeast Kaua‘i includes about 37,500 residents in approximately 11,578 households. This population is slightly younger than Kaua‘i County as a whole. The median age of Southeast Kaua‘i residents is 41.6 years, versus the county median of 42.0 years.

Nearly half of Southeast Kaua‘i residents are Asian (49.2%), generally Filipino (59.1% of Asian residents) and Japanese (27.5% of Asian residents). This compares to 11 percent for the County as a whole, Southeast Kaua‘i has fewer Native Hawaiian residents (10.3%). Approximately 38 percent of this community’s residents are White (37.9% vs 41.7% for the County) and approximately two in ten Southeast Kaua‘i residents have mixed-raced backgrounds (22.1%; vs 20.0% for the County).

The average household size, 3.24 persons, is larger than the county average of 2.88 persons per household. Of the roughly 11,600 occupied housing units in Southeast Kaua‘i, 63.2 percent are owner-occupied, which is essentially equal to the county average of 63.3 percent.

ECONOMIC CHARACTERISTICS

The 2016 median household income for the County of Kaua‘i is $68,224. At $67,231, the median household income for Southeast Kaua‘i is slightly lower.

In 2016, Southeast Kaua‘i had about 13,880 housing units. Exactly half of Kaua‘i County households spend 30 percent or more of their income for housing. Southeast Kaua‘i households fare slightly worse, with 53.2 percent devoting 30 percent or more of their household income to cover the cost of housing.

Renters living in Southeast Kaua‘i have a median monthly rent payment of $1,371. Countywide, median monthly rent payments are lower at $1,279. Similarly, Southeast Kaua‘i homeowners make median monthly housing payments of $2,149. Across the County, homeowners pay a nearly identical median monthly shelter payment of $2,156. In 2016, the median value of owned units in Kaua‘i County was $493,800, versus a median value of $475,000 for homes in Southeast Kaua‘i.

The percentage of persons age 16 years or older in the labor force is approximately equal for Southeast Kaua‘i (66.8%) and for the County as a whole (65.1%). As the population ages, the size of the labor force decreases. The 2016 unemployment rate was notably lower for Southeast Kaua‘i (3.7%) than for the County of Kaua‘i (5.1%). According to the most recent projections, the countywide unemployment rate is expected to remain fairly stable over the next two decades. The mean travel time to work for Southeast Kaua‘i residents, 22.5 minutes, is equal to the county average of 22.6 minutes.

Residents of Southeast Kaua‘i were most commonly employed in service occupations (28.2%), management, business, science and arts occupations (27.3%), sales and office occupations (23.7%). These are similar to the most common occupations throughout the County, but the County is more evenly divided at 28.9 percent Service and 28.2 management, business, science and arts occupations. The largest industries in Southeast Kaua‘i are arts, entertainment, and recreation (22.4%), followed closely by accommodation and food services (20.0%) and educational services and health care and social assistance (17.0%). The top two industries for

Kaua‘i County were arts, entertainment, and recreation and accommodation and food services (22.9%) and educational services, and health care and social assistance (15.8%).

STAKEHOLDER INTERVIEWS

OBJECTIVES AND METHODOLOGY

The objectives of stakeholder interviews are to identify and understand local sensitivities and expectations of the Waiahi Hydropower Long-Term Lease Project.

To provide an in-depth level of stakeholder input, SMS identified and contacted thirty-five community leaders, key stakeholders, and community groups to identify and understand local sensitivities and expectations associated with the proposed water lease. Interviews were prioritized based on the focus of the organization/agency in relation to the East Kaua‘i community and potential impact areas of the project. The list of contacted community leaders, key stakeholders, and community groups is provided in Appendix I.

A total of fifteen interviews were completed with East Kaua‘i based agencies, businesses or organizations. Additionally, most of the individuals interviewed were current East Kaua‘i (Wailua, Hanamā‘ulu, Līhu‘e) residents with strong ties to those communities. There were two refusals to participate for unspecified reasons.

SMS professionals conducted interviews from August 20 through October 5, 2018. All interviews were conducted by phone based on the availability of the participants during the fielding period. A copy of the *Waiahi Hydropower Long-Term Lease Project Description* was shared with participants via email prior to their scheduled interviews. A copy of the *Waiahi Hydropower Long-Term Lease Project Description* is provided in Appendix II and a copy of the *Waiahi Hydropower Project Executive Interview Outline* is provided in Appendix III.

All respondents are long term Kaua‘i residents that have been in their positions for more than five years, many for much longer. The majority also have multigenerational ties to Kaua‘i communities and are very familiar with the project area and the history of the system. Many have frequented the project sites for recreational purposes particularly hiking, hunting, and swimming.

FINDINGS

Community Issues and Concerns

The top five identify “community issues and concerns” were (unaided responses are in no order):

- Cost of Living;
  In general, the cost-of-living overall is considered very high on Kaua‘i. Families struggle to make ends meet due to lower paying service jobs relative to the cost of living.
- Affordable Housing;
  A major factor in the cost of living is the insufficient number of affordable housing units, both rental and for purchase, on the island.
- Economy;
  The economy on Kaua‘i is heavily dependent on the visitor industry creating service, arts

and entertainment jobs.

- Infrastructure;
  Infrastructure, particularly roads and bridges, are need of repair and/or replacement. Infrastructure investment has not kept pace with the increasing number of households and visitors.
- Sustainability;
  The residents of Kaua'i are very concerned with the long-term sustainability of natural resources throughout the island.

The Waiahi Hydropower Long-Term Lease Project is widely known in the community. Prior to the stakeholder interviews, only two participants were not aware of the project. Overall residents understand that the project affects many of their important issues:

- The overall cost of living is directly impacted by the cost of utilities, especially when factoring in the already higher than average cost of rent, food, gas, etc. on the island.
- Infrastructure is directly impacted with KIUC as Kaua'i's only provider of electricity; they are the electrical infrastructure of Kaua'i. Additionally, with the State's 2045 clean energy goals, the infrastructure of all of Hawaii's electrical providers is in transition. Water from the system also supports the Kaua'i Department of Water (DOW) infrastructure.
- The economy is directly impacted by lower energy cost translating into more dollars available for other commodities, goods, and services. Also, important are the agricultural products produced by those who rely on the downstream flow of the system and their impact on the local economy, and the supply of water for future DHHL development at the end of the system.
- Sustainability is a direct function of the proposed project as a sustainable renewable energy source for Kaua'i that is owned by the members of KIUC.

The project received very positive reactions from most respondents. It is viewed as an upgrade of the existing infrastructure rather than "new construction" and is seen as an opportunity to revive and improve the existing system. The continued maintenance of the system by KIUC is also seen as a bonus as it continues to support downstream access to water for multiple uses. Respondents stated that highlighting downstream uses/needs (DOW, Agricultural Lease Tenants, etc.) the system supplies is a key factor toward increasing community support for the Long-Term Lease.

The project is also viewed as a positive step toward reaching the County and State 100% renewable energy goal by 2045. All participants viewed hydropower as beneficial to the island's renewable energy portfolio, however, the type/design of preferred systems varied greatly. The instream/non-consumptive (like the Wainiha facility), and pumped storage type systems were the most favored.

Most respondents were very positive about the outreach efforts to the community. They felt that keeping the community informed of the progress of the permitting process will help to alleviate potential push back from the community. It was also felt that regularly engaging the Native Hawaiian community would be beneficial.

Opposition to the project is directly related to the diversion of water, Interim Instream Flow Standards (IIFS), and the impacts to native aquatic species, not specifically to hydropower. There was still a lack of clarity by some respondents on the following issues:

1. Clear definitions of what current Interim Instream Flow Standards (IIFS) are. (minimum levels, percentage of flow restored, etc.)

    a. How are they determined?
    b. Who and how levels will be monitored?
2. How much water does the Waiahi system require?

It is understood that water needs along the river are being met at the present time. However, respondents are unclear how much diverted water will be needed in the future, therefore they have a concern about a long-term water lease.

Others concerns expressed were:

1. The legacy of misappropriation of the water resource.
    a. The plantation/post-plantation use and management of the water system has not been pono.
    b. Why is KIUC not paying the same rates as others for consumptive use?
2. Need for a plan to restore the public's trust in those responsible for managing the water resource.
3. Unsure of the capacity of the system to meet future development needs.
    a. Will there be sufficient water for the DHHL planned development mauka of the Lydgate recreational area?
4. Will agriculture in the areas serviced be impacted if the current diversions are changed? Will there be enough water for future agricultural needs?
    a. A need to promote future diversified agriculture in the region.
        i. Fallow (unused) agricultural lands in the Kālepa region.
5. Availability and capacity of non-diverted resources in the area to meet current and future needs.

MITIGATIONS

In order to address any project-related concerns, stakeholders advocated a comprehensive publicity campaign to educate Kaua'i residents about the proposed project and to combat any misinformation that may be circulating. Keeping the public informed (community meetings, publications, social media campaigns etc.) and raising awareness regarding the objectives of the upgrades and the long-term water lease was highly recommended. Regular community engagement and project updates through a variety of avenues, such as community meetings, radio ads, and social media, were viewed as the most effective means of communication.

Clear definitions of what the current Interim Instream Flow Standards (IIFS) are was noted as a key focus area. Increasing public understanding of the current and planned means of monitoring the IIFS should also be a priority.

Regularly engaging the Native Hawaiian community and actively involving them in the process was also recommended.

Lastly, Stakeholders provided suggestions for the framing of the project and ways to increase community support of the project.

1. Frame the project as meeting the Island's needs.
    a. Highlight the needs of the community the system is currently meeting. Share the environmental impact report from TRUTTA (Appendix IV) showing minimal impact to native stream species.
        i. Department of Water
        ii. KIUC
        iii. Agricultural uses (Grove Farm lessees and others)
2. Identify key advocates to bridge gaps between those for and opposed to the long-term lease.
    a. Cultural Practitioners
    b. Community Groups
3. Address opposition issues and questions openly and promptly.
    a. Conduct forums to address the issues and air misconceptions/misinformation.
4. Engage the community in the monitoring process
    a. Community based Instream Flow Standards (IIFS) monitoring
    b. Live feed/weekly updated interactive access to key monitoring locations
    c. Educational programs designed around monitoring systems

Overall, the proposed project was perceived to be a positive initiative that will help reach the County and State renewable energy goals of 100% by 2045.

CLARIFICATIONS

The following provides additional clarifications to resident concerns.

1. IIFS: Instream Flow Standards are set and managed by the Commission on Water Resource Management (CWRM). CWRM staff conducted an extensive evaluation on the North Fork and Waikoko streams and diversions for the purposes of recommending an IIFS for those streams. At the August 2018 CWRM meeting, CWRM staff submitted an IIFS recommendation of 4 MGD for North Fork Wailua River and an IIFS of 0.8 MGD for Waikoko Stream. The Commission has not acted on this and has approved entering into contested case and mediation. However, KIUC has already implemented changes to the ditch system to ensure the staff recommendation of 4 MGD at North Fork and 0.8 MGD at Waikoko is consistently maintained in the natural stream, downstream of the diversions.
    a. Revocable Permit: KIUC's RP was initially approved by the BLNR in 2003 and has been renewed each year since that time. In December 2018, the BLNR approved the holdover with an imposed limitation on diversion amounts with the intention of implementing the recommended IIFS at both diversions. KIUC has made changes to the ditch system to meet the CWRM staff recommended IIFS amounts with these diversion limitations.
2. Community Outreach: KIUC has engaged in extensive outreach efforts for the Waiahi Hydropower Long-Term Lease Project. In 2017 KIUC held several site visits to the diversions and hydropower plants with community members including Kūpuna. KIUC has also met with community members one on one, in small groups, and has welcomed testimony to the KIUC Board several times over the last two years.
3. Other Uses: After leaving the hydropower plants, water is discharged into Waiahi Stream, which is a tributary to the South Fork Wailua River. There are two diversions downstream of the discharge point: The Upper Līhuʻe Diversion and the Hanamāʻulu Diversion. The Upper Līhuʻe Diversion and Ditch System supply a number of agricultural and commercial interests throughout the greater Līhuʻe area from Ahukini to Puhi. The Hanamāʻulu Diversion and Ditch System serve several agricultural interests on both private and State of Hawaii Department

of Agriculture Agribusiness Development Corporation (ADC) land, provide water for a drinking water treatment facility, and historically served the DHHL lands in Wailua.

4. DHHL: KIUC has met with DHHL several times to discuss their water needs and future development plans on their land in Wailua and hosted them for a site visit to the diversions and the hydropower plants. Historically the DHHL Wailua lands were served by the Hanamāʻulu Ditch, which diverts water from the South Fork Wailua. The natural flows are supplemented by water discharged from KIUC's hydropower plants. DHHL submitted water reservations for the Wailua watershed to CWRM and both reservations were approved. It is unclear at this time if DHHL will access their water reservation through the ditch system as was previously done or if they will deliver surface water through another mechanism. However, if KIUC is granted a long-term lease, it will be subject to DHHL's water reservation.

ECONOMIC IMPACT ASSESSMENT

This Economic Impact Assessment was prepared to estimate the effects of the Waiahi Hydropower long-term lease options on short-term employment, employment income, and contribution to the local tax base. The current operation scenario is the base model. Three future operational scenarios are then explored:

- Long-term water lease, system improvements, and operations at 100% capacity,
- Loss of the water lease and operating with the ‘Ili‘ili‘ula diversion alone at 41.5% capacity, and
- Loss of the water lease and a complete shutdown of the Waiahi hydropower facilities.

In addition to the analysis on these scenarios is a section on other economic impacts that discusses potential impacts to additional sectors of the economy affected by the water lease.

APPROACH AND TERMINOLOGY

This section reviews the approach that was used to estimate the different project impacts on Kaua‘i’s economy. As background to this economic impact assessment, here are the technical terms used to characterize different types of impacts:

- *Direct* jobs/earnings/taxes are created in industries that are immediately involved with the project;
- *Indirect* jobs/earnings/taxes are created in businesses that supply goods and services to the first-tier industries due to the project;
- *Induced* jobs/earnings/taxes are created as workers re-spend their income on goods and services as a result of the change in jobs and earnings induced by the direct and indirect effects of the project;
- *Personal Consumption Expenditures* (PCE), or the *PCE Index*, measures price changes in consumer goods and services.

For this analysis, the 2012 Hawai‘i Inter-County Input – Output (I-O) model was chosen over the state I-O model. Both I-O models were developed by the Department of Business, Economic Development & Tourism (DBEDT), however, the Inter-County model was better suited to for this evaluation. The Inter-County I-O model shows how goods and services move among different sectors within the county. It also considers economic movement between counties. These two specifications allow us to better assess the economic impacts for a project that will be implemented in a single county, while not omitting the important interactions and linkages among industries across counties.

According to the Inter-County I-O model, if a new project increases industries’ final demand (values of goods and services) in Kaua‘i County, the increased demand from those industries will create increased output in Kaua‘i County. It follows that the increased output in Kaua‘i will increase demand for goods and services from other regions of the state, resulting in increased output in those counties. These effects are referred to as the spillover effects. In order to meet the increased demand from Kaua‘i, industries in O‘ahu, Maui, and Hawai‘i counties will have to expand their production. This may, in turn, create new demand for goods and services again in Kaua‘i in addition to the first round of output increase due to the new project. The latter effects

are referred to as feedback effects.

The Inter-County I-O model also allows us to assess impacts more accurately on county-specific economic activities. It is also a more appropriate framework for producing long-range economic and population forecasts specifically for counties compared to the state I-O model.

It is worth-noting that both the Inter-County I-O model and state I-O model provide State tax multipliers and not County tax multipliers. To resolve this issue, the County tax was estimated by taking the average ratio of Kaua‘i tax collection to State tax collection over the last decade, which was estimated to be 2.7 percent. This ratio was then applied to the State tax estimate to calculate the County tax revenues.

ASSUMPTIONS AND CAVEATS

Here are a few underlying assumptions.

First, based on the information available, it is assumed that the Waiahi Project funds are an external investment financed by KIUC and not a reallocation of funds that are already part of the local economy.

Second, the 2012 Inter-County I-O model provides multipliers through 2022, however, there is no project timeline available. It is assumed that should the long-term water lease be granted in 2019, the construction phase would commence in 2020. As such, the analysis is based on 2020 multipliers to provide a baseline impact for the project in lieu of a final project timeline.

Third, the proposed upgrades project budget separates Labor and Materials costs. Accordingly, analyses were run to estimate the overall direct, indirect, and induced jobs, earnings, and taxes for the project based on the Labor budget to reflect potential impacts of the project. It was assumed that 100 percent of the major construction cost will be retained locally, that is, no out-of-state labor will be used.

Our model estimates were based on current dollars. To fully capture the direct, indirect, and induced effects, the 2020 type II multipliers for jobs, earnings, and taxes were used. The K- S2 Construction industry multipliers were selected to align with the proposed project and current operations as the majority (80%+) of the five cent per kwh cost (average annual operations cost under normal conditions) of the hydro production is either KIUC labor or a ditch maintenance subcontractor.

Our model estimates for these scenarios were based on current dollars. Offset hydropower production in the reduced scenarios is based on current diesel power production costs to replace the loss of hydropower currently produced by the facilities. Additionally, the operations and maintenance costs will only be reduced incrementally, but the production will fall considerably. The maintenance and staffing of the hydropower facilities remain similar even if it is operating at lower levels or has less water. Therefore, the cost per kwh is much higher with reduced output. One-half of the output equals twice the cost per kwh. So, there is a two layered cost implication: 1) generation that needs to be replaced with diesel and 2) two times increase in cost per kwh for the lost hydro production. To fully capture the direct, indirect, and induced effects, the 2020 type II multipliers for jobs, earnings, and taxes were used. The K-S7 Utility and K-S2 Construction industry and PCE multipliers were selected to align with the reduced operations estimated impacts on Kaua‘i’s economy.

The following economic assessments are based on the following four scenarios:

A. Current Operations
B. Long-Term Water Lease and System Improvements
C. Reduced Operations if Lease not Granted, and
D. Shutdown of Operations if Lease not Granted.

A. CURRENT OPERATIONS

Under normal operating conditions the combined Upper and Lower Waiahi hydro facilities annual production output is 8670 MWh at an average cost of five cents per KWh (see Appendix V). This equates to an annual operating cost of $438,000. The estimated earnings (payroll) figures are based on an assumed 80+ percent of the hydropower production cost as either KIUC labor or ditch maintenance subcontractor work that is most accurately represented by the K-S2 Construction multipliers. As Exhibits A, B, and C show, this amounts to an estimated five person-years of jobs, $200,000 in earnings impacts, $44,500 in State taxes, and about $1,200 in County taxes annually. It is important to keep in mind that the low annual operation cost translates into dollars saved by KIUC customers for alternative diesel power production that can be used on other commodities while still providing positive inputs to the local economy.

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Exhibit A: Current Operations Impact: Jobs

Jobs	Hydro Cost	Multiplier	All Jobs Created
2020	$438,000.00	11.5	5.04

Exhibit B: Current Operations Impact: Earnings

Earnings	Estimated Earnings (Utility Payroll)	Multiplier	All Earnings Impact
2020	$291,708.00	0.69	$201,278.52

Exhibit C: Current Operations Impact: Taxes

Taxes	Operations Expenditures	Multiplier	All State Taxes	Multiplier	Estimated County Taxes
2020	$438,000.00	0.1016	$44,500.80	0.027	$1,201.52

B. LONG-TERM WATER LEASE AND SYSTEM IMPROVEMENTS

This scenario reflects the upgrades that KIUC will make to the hydropower plant should they receive a new long-term water lease. This assumes that the cost of generating electricity will remain the same as the current operation and that the improvements to the system will continue to provide benefits to the community.

The Labor budget estimate is $650,000 for the construction activities associated with upgrades to the system. It is assumed that if the long-term water lease is granted in 2019, the construction phase would commence in 2020. As such, the analysis is based on 2020 multipliers to provide a baseline impact for the proposed project. A defined project timeline and budget may extend these impacts to additional years.[4]

The analyses were run to estimate the overall direct, indirect, and induced jobs, earnings, and taxes for the project budget to reflect potential impacts of the project on Kaua'i's economy. It is also important to note that these estimates do not include the project soft costs or materials and only reflect the labor portion of the proposed upgrades project.

The sections covered for this analysis include:

- Employment – Economic Impact on Jobs,
- Earnings – Economic Impact on Earnings, and
- Fiscal Impacts – Economic Impact on State and County Taxes

The short-term employment created by the proposed construction aspect of the project will have positive impacts on Kaua'i's economy. As Exhibit D shows the estimated number of total (direct, indirect, and induced) short-term jobs created by the proposed upgrades project is about seven person-years[5] of employment, all of which will be retained locally.

Exhibit D: Economic impact of the Project: New Jobs

Jobs	Construction Labor	Multiplier	All Jobs Created
2020	$650,000.00	11.5	7.48

The construction earnings will have a positive impact on the economy. Payroll accounts for 66.6 percent (two-thirds) of the construction labor budget. As Exhibit E shows, the estimated construction payroll will be $432,900 of which $298,700 will be retained locally.

[4] It is important to note that should a new Water Lease be granted; a more in-depth analysis of the long-term impacts could be run. However, the 2012 Inter-County I-O model only provides Utility and PCE multipliers through 2022, whereas the Water Lease in question could be for up to 65 years. To resolve this issue, the multipliers for 2023-2085 would need to be generated to complete the analysis.

[5] Person-years is the number of full-time equivalent jobs required to complete the work in a period.

Exhibit E: Economic impact of the Project: Earnings

Earnings	Estimated Earnings (Construction Payroll)	Multiplier	All Earnings Impact
2020	$432,900.00	0.69	$298,701.00

Spending will have a positive economic impact on both the State and County tax revenues. As Exhibit F shows the contribution to the State tax revenues as a result of this project is estimated to be $66,000 with an estimated $1,800 in new Kaua‘i County tax revenues

Exhibit F: Economic impact of the Project: Taxes

Taxes	Construction Labor	Multiplier	All State Taxes	Multiplier	Estimated County Taxes
2020	$650,000.00	0.1016	$66,040.00	0.027	$1,783.08

As the data shows, the proposed project is expected to have positive impacts on Kaua‘i’s economy at multiple levels. An estimated seven person-years[6] of employment, $298,700 in earnings impacts, $66,000 in State taxes, and $1,800 in Kaua‘i County taxes estimated for 2020 construction labor activities alone.

[6] Person-years is the number of full-time equivalent jobs required to complete the work in a period.

C. REDUCED OPERATIONS

Two analyses were run to estimate the overall direct, indirect, and induced jobs, earnings, and taxes for the reduced and discontinued operations scenario estimate rates to reflect potential impacts of each on Kaua‘i’s economy. The following analyses are based on the 2020 multipliers to provide a baseline impact for the current and reduced operations scenarios.

The sections covered for this analysis include:

- Employment – Economic Impact on Jobs,
- Earnings – Economic Impact on Earnings, and
- Fiscal Impacts – Economic Impact on State and County Taxes

If the long-term Water Lease is not granted, it may be possible for the Lower Waiahi hydro facilities to operate at 41.5% capacity (3635 MWh) using the ‘Ili‘ili‘ula diversion only. This scenario would equate to a 58.5% reduction (5125 MWh) of the current Waiahi facilities production. As previously discussed, the operations and maintenance costs will be reduced incrementally, but the production will fall considerably. The maintenance and staffing of the hydropower facilities remain similar at reduced operation levels. Therefore, the cost per kwh is much higher with reduced output. One - half the output equals twice the cost per kwh. There is a two-tiered cost implication: 1) hydroelectric power that needs to be replaced with diesel and 2) a doubling in cost per kwh for the remaining hydropower production. The K-S7 Utility and K-S2 Construction industry and PCE multipliers were selected to align with the reduced operations estimated impacts on Kaua‘i’s economy. Jobs discussed in this section are at the PCE level (jobs in other sectors of the economy) only, given the previously discussed maintenance and staffing of the hydro facilities.

To convey the impact of this loss we have included the hydropower utility production loss, the diesel production needed to cover the offset hydropower production, and the overall impact on Kaua‘i’s PCE[7] as a result. The higher cost of electricity to the community will have a negative impact because it reduces the dollars available to spend elsewhere.

As Exhibit G shows, the 58.8% reduction in hydropower operations would result in an estimated loss of $512,400 in hydropower operations costs and incur more than $1 million increase in alternative diesel operations costs to offset hydropower production for a total of over $1.5 million in PCE impacted expenditures. It is worth noting here that the cost of diesel energy production for one year at this level is two times the budget for the proposed upgrades project and more than three times the current annual hydropower production cost.

Exhibit G: Reduced Operations Impact

Lost Hydro Cost	Incurred Diesel Cost	Total
$512,460.00	$1,023,750.00	$1,536,210.00

[7] Personal Consumption Expenditures (PCE), or the PCE Index, measures price changes in consumer goods and services

As Exhibits H, I, and J show, a reduction in operations amounts to a loss of an estimated 14 person-years of PCE jobs[8], more than $127,000.00 in earnings impacts, $103,500 in State taxes, and more than $71,000 in County taxes to the Kaua'i's economy in 2020 alone.

Exhibit H: Reduced Operations PCE Impact: Jobs

Jobs	Cost	Multiplier	All Jobs Lost
2020	$1,536,210.00	9.4	14.44

Exhibit I: Reduced Operations PCE Impact: Earnings

Earnings	Estimated Earnings Lost	Multiplier	All Earnings Impact Lost
2020	$302,633.37	0.42	$127,106.02

Exhibit J: Reduced Operations PCE Impact: Taxes

Taxes	Operations Expenditures	Multiplier	All State Taxes Lost	Multiplier	Estimated County Taxes Lost
2020	$1,536,210.00	0.0674	$103,540.55	0.027	$2,795.59

To accurately reflect the impact of this reduced operations scenario on Kaua'i's economy, we should also consider the loss of the proposed project revenues (Exhibits D-F) as well. When combined with the PCE impacts they amount to an estimated loss of up to 22 person-years of jobs, $425,807 in earnings impacts, $169,580 in State taxes, and $4,578 in County taxes.

[8] PCE Jobs are jobs in other sectors of the economy impacted by the loss of revenue into the local economy.

D. SHUT DOWN OF OPERATIONS

If the long-term water lease is not granted and the Waiahi facilities are shut down, the cost to cover the 8760 MWh of hydro power through diesel power production is estimated to be $1.75 million annually, and likely to increase in the future. This amounts to almost four times the current annual hydropower production costs and is equal to the low-end proposed project estimate. Here again, the higher cost of electricity will have a negative impact to the community overall as they pay more for the same level of "service" they are currently receiving.

The added cost in terms of jobs and operations amounts to an estimated loss of 16 person-years of jobs, more than $220,500 in earnings, $117,900 in State taxes, and more than $3,000 in County taxes in 2020 alone.

Exhibit K: Loss of Operations PCE Impact: Jobs

Jobs	Project Cost	Multiplier	All Jobs Lost
2020	$1,750,000.00	9.4	16

Exhibit L: Loss of Operations PCE Impact: Earnings

Earnings	Estimated Earnings (Project Payroll)	Multiplier	All Earnings Impact Lost
2020	$525,000.00	0.42	$220,500.00

Exhibit M: Loss of Operations PCE Impact: Taxes

Taxes	Project Expenditures	Multiplier	All State Taxes Lost	Multiplier	Estimated County Taxes Lost
2020	$1,750,000.00	0.0674	$117,950.00	0.027	$3,184

As with the previous section, to accurately estimate the impacts of loss of operations scenario on Kaua'i's economy, we should also consider the loss of the proposed project revenues (Exhibits D-F) as well. When combined with the PCE impacts this amounts to an estimated loss of up to 23 person-years of jobs, $519,201 in earnings impacts, $183,990 in State taxes, and $4,967 in County taxes.

The loss of the water lease and the subsequent reduced and or loss of the Waiahi facilities operations will have substantial impacts on Kaua'i's economy in both the short- and long- term given the expected increase in diesel prices and loss of this low-cost renewable source of energy production.

The economic impacts studied here do not include potential negative impacts on agriculture and other sectors of the economy currently benefiting from the systems supplied by the diversions if the Long-Term Lease is denied. These impacts are discussed in the following section.

OTHER ECONOMIC IMPACTS

The KIUC Waiahi Hydro water supply infrastructure and the downstream connected ditch systems are a vital resource to many public and private entities spanning from Puhi to Wailua River. Aside from the KIUC Revocable Permit (RP) and the Grove Farm owned portions of these ditch systems, the East Kaua‘i Water Users Cooperative also holds a RP from DLNR for the Hanamā‘ulu Ditch on the State of Hawaii Department of Agriculture Agribusiness Development Corporation (ADC) administered “Kālepa Lands” between Līhu‘e and Kapa‘a and behind Kālepa Ridge. The following is a summary breakdown of these systems as depicted in Figure 3 from the East Kaua‘i Water Users’ Cooperative 2018 *Blue Hole Diversion and East Kauai Ag Lands* White Paper provided in Appendix VI.

The ADC Kālepa Lands include approximately 6,500 acres, shown in pink. The lower portion of the ADC Kālepa lands are irrigated by the Hanamā‘ulu Ditch system. This is a total of about 800 acres, of which 300 are being actively farmed.

Currently, the only surface irrigation water conveyance ditch system serving the 800 acres is the Hanamā‘ulu Ditch. The water in Hanamā‘ulu Ditch is sourced from the Hanamā‘ulu Ditch Diversion located on the Wailua River South Fork on the adjacent Grove Farm property. Multiple diversions, starting with the Blue Hole diversion on the Wailua River North Fork and Waikoko Stream diversion, both on State land (at upper left), along with multiple diversions on Grove Farm land along the ‘Ili‘ili‘ula North Wailua Ditch and the Waiahi - ‘Ili‘ili‘ula Ditch are water sources conveyed to the Upper and Lower Powerhouses operated and maintained by KIUC.

The collected water flows from the Upper Powerhouse to the Lower Powerhouse mostly by tunnels, then is discharged in Waiahi Stream from which it is partly diverted into the Upper Līhu‘e Ditch which services farmlands all the way to Puhi. Waiahi Stream continues and merges as a tributary with the Wailua River South Fork. Water is again diverted at the Hanamā‘ulu Diversion on the South Fork River downstream into the Hanamā‘ulu Ditch which flows across Grove Farm land.

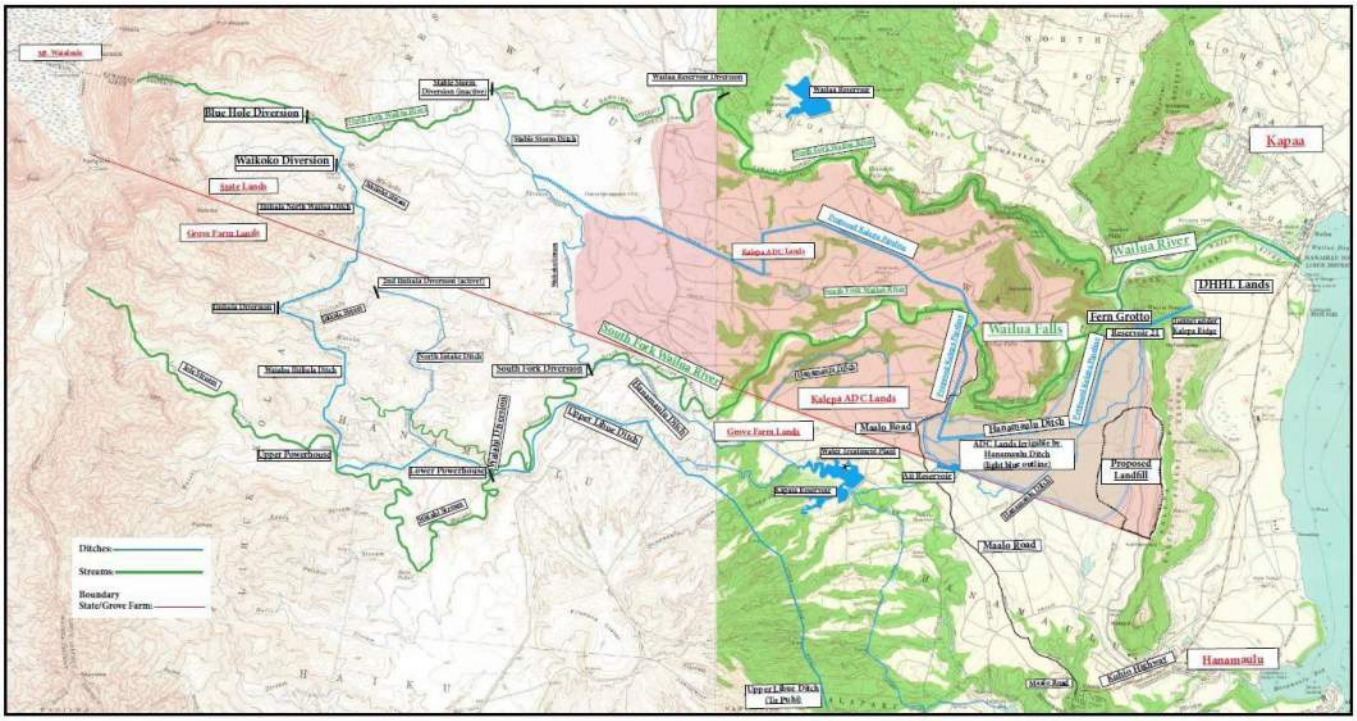
Hanamā‘ulu Ditch feeds Kapaia Reservoir then crosses into the ADC Kālepa lands, until it crosses Mā‘alo Road from which point it can irrigate most of the 800-acre fields. At the bottom, far east, of the Kālepa lands, the Hanamā‘ulu Ditch fills Reservoir 21 (on top of Fern Grotto). From Reservoir 21, a tunnel under Kālepa Ridge conveys water to the DHHL lands adjacent to Kūhiō Highway parallel to Wailua River.[1]

The East Kaua‘i Water Users Cooperative issued the following statement in December of 2018:

> “If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question—a key issue which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamā‘ulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process.[9]

[9] EKWUC *Blue Hole Diversion and East Kauai Ag Lands* White Paper, December 2018

Figure 3: Waiahi Hydro Downstream Connected Ditch Systems



In addition to the ADC lands in production, Grove Farm has 65 agricultural tenants on 3,800 acres of productive agricultural lands (partially shown in the lower half of Figure 3). Current ventures include ranching (cattle and sheep), vegetable farms (taro, mixed greens, pumpkin, beans, etc.), fruit orchards (papaya, banana, lychee, dragon fruit, etc.), tropical flower farms (cut flowers and ornamentals), landscape nursery (sod, native plants, container plants, field stock trees and palms, etc.), and algae for bio-diesel.

The Waiahi Water Company is a Grove Farm tenant that uses water from the Kapaia Reservoir and has a partnership with the County of Kaua‘i Department of Water to supply up to 3 million GPD of potable drinking water that services approximately 15,000 residents.

Kaua‘i Backcountry Adventures is a locally owned and operated tour/activities company that actively uses the ditch systems to conduct water rafting tours.

The system also supplies non-potable irrigation water to Government facilities and projects including the Līhu‘e Gateway project, the Civic Centers – Judiciary and KPD facilities along Kūhiō Highway, Vidinha Stadium and Soccer Fields, Kaua‘i Community College (grounds, lo‘i, and māla,) and the new Adolescent Treatment & Healing Center in Hanamā‘ulu

The economic impacts of KIUC’s request for a long-term water lease go far beyond the utility and its customers to multiple sectors of the economy that have a vested interest in the systems that are directly impacted by it for both present and future uses.

SUMMARY

The Waiahi Long-Term Water Lease for KIUC will have profound impacts on several sectors of Kaua'i's economy. It will allow KIUC to continue providing some of the most affordable electricity in the KIUC grid. In addition, ongoing operations annually provides:

- an estimated five person-years[10] of jobs,
- $200,000 in earnings impact,
- $44,500 in State taxes, and
- $1,200 in County taxes.

The proposed upgrades to the system that would be undertaken with the long-term lease granted, could generate up to

- Seven person-years of employment,
- $298,700 in earnings impacts,
- $66,000 in State taxes, and
- $1,700 in Kaua'i County taxes.

The Long-Term Water Lease will continue to save the community the higher cost of electricity for the same level of "service" they are currently receiving. This translates into dollars that can be used on other commodities and supports the County and State renewable energy goal of 100% by 2045.

The multiple entities that depend on the downstream systems supplied by the diversions will retain their current flow of water with the KIUC Long-Term Water Lease. These entities include thousands of acres of prime agricultural lands, potable drinking water facilities, public sports and recreation fields and facilities, civic and educational facilities, the Kaua'i Gateway Project, and DHHL lands. Not issuing the Long-Term Water Lease will have significant negative impact to the social and economic fabric of Kaua'i on multiple levels.

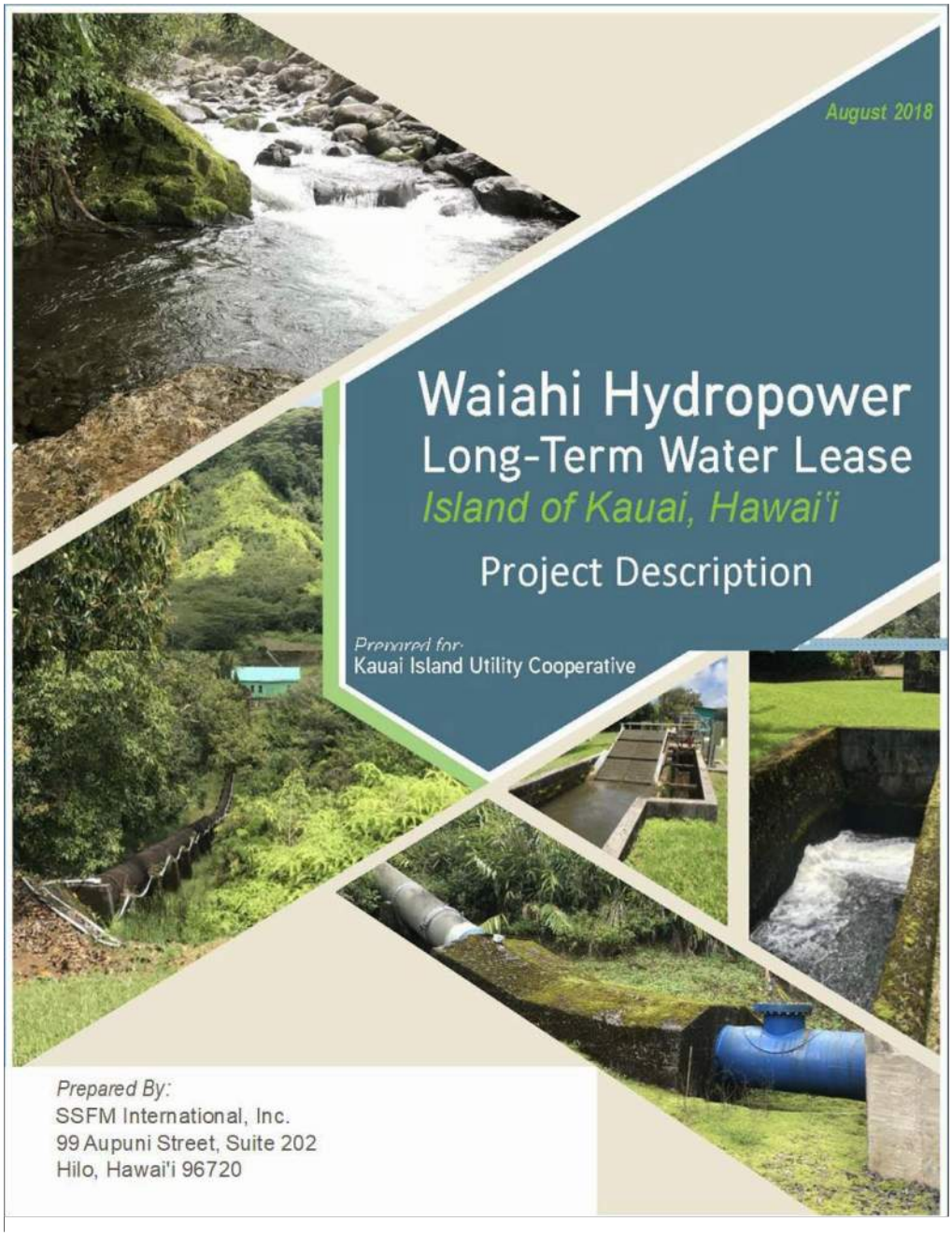
.

[10] Person-years is the number of full-time equivalent jobs required to complete the work in a period

APPENDIX I

Stakeholders List
County of Kaua`i Office of Economic Development
Kaua`i County Farm Bureau
Kaua`i Visitors Bureau
County of Kaua`i Office of Economic Development
Hawaii Small Business Development Center – Kaua`i,
Kaua'i Economic Development Board
Kaua‘i County Council
Kaua‘i County Council
Kaua‘i County Council
Kaua‘i County Council
Kauai Department of Transportation
Chamber of Commerce
Kaua‘i Planning & Action Alliance
Contractor's Association of Kauai
County of Kaua`i Office of Economic Development - Ag Tourism & Ranching
Kauai County Water Department
Garden Island Resource Conservation and Development, Inc.
State of Hawai‘i Department of Hawaiian Home Lands (DHHL)
Office of Hawaiian Affairs – Kaua‘i Office
Kawaikini School
Shioi Construction
Na Pua Noe'au Kaua'i
Hawai‘i Alliance for Progressive Action (HAPA)
Hawai‘i Alliance for Progressive Action (HAPA)
Malina Ranch
Kaua'i Community College
Kaua'i Community College
Kaua'i Community College
Kaua'i Taro Company
Kaua’i Watershed Alliance: The Nature Conservancy, Kaua’i Program
Hawaii State Legislature
Grove Farm Company
Hanama‘ulu Community Association
Lihue Business Association

APPENDIX II


August 2018
Waiahi Hydropower
Long-Term Water Lease
Island of Kauai, Hawai'i
Project Description
Prepared for:
Kauai Island Utility Cooperative
Prepared By:
SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawai'i 96720

Introduction

The Kauai Island Utility Cooperative (KIUC) is an operating utility engaged in the production, purchase, transmission, distribution, and sale of electricity on the Island of Kauai. KIUC is currently diverting water from the North Fork of the Wailua River and Waikoko Stream (collectively referred to as “Blue Hole”) to operate two hydropower plants on Waiahi Stream, the Upper Plant and the Lower Plant pursuant to Revocable Permit No. S-7340 issued by the Board of Land and Natural Resources (BLNR).

The Upper and Lower Waiahi Hydropower Plants have been in operation for over 80 years and were originally built by Lihue Plantation Company for their sugar operations. These hydropower plants use water diverted from streams within the Wailua watershed. The first lease for the use of the water was issued by the State of Hawai‘i to the East Kauai Water Company in 1965. The lease allowed for a partial diversion of water from the Blue Hole Diversion. The lease had a term of 30 years and expired in 1995, when it was continued via a revocable permit.

In 2004, KIUC requested a long-term lease from the BLNR for the diversion of water from Blue Hole for the hydropower plants.

Description of Existing Facilities

The Upper and Lower Waiahi Hydropower Plants were originally built by the Līhu‘e Plantation Company for their sugar operations. The diversion and ditch system are typical plantation style with concrete diversions spanning the streams. The two hydropower plants generate approximately 1.5 megawatts (MW) of electricity. The Upper Waiahi Hydropower Plant was put into service in 1931 and has an output of 0.7 MW. The Lower Waiahi Hydropower Plant was first put into service in 1914 with a capacity of 600 kilowatt seconds. In 1941, the Lower Waiahi Hydropower Plant was put into service with an output of 0.8 MW. The continued operation of these two facilities allows KIUC to avoid burning approximately 675,000 gallons of diesel per year.

Water to both hydropower plants is provided via a number of diversions from the North Fork and South Fork basins of the Wailua River. The primary diversions to the Upper Waiahi Plant include the following:

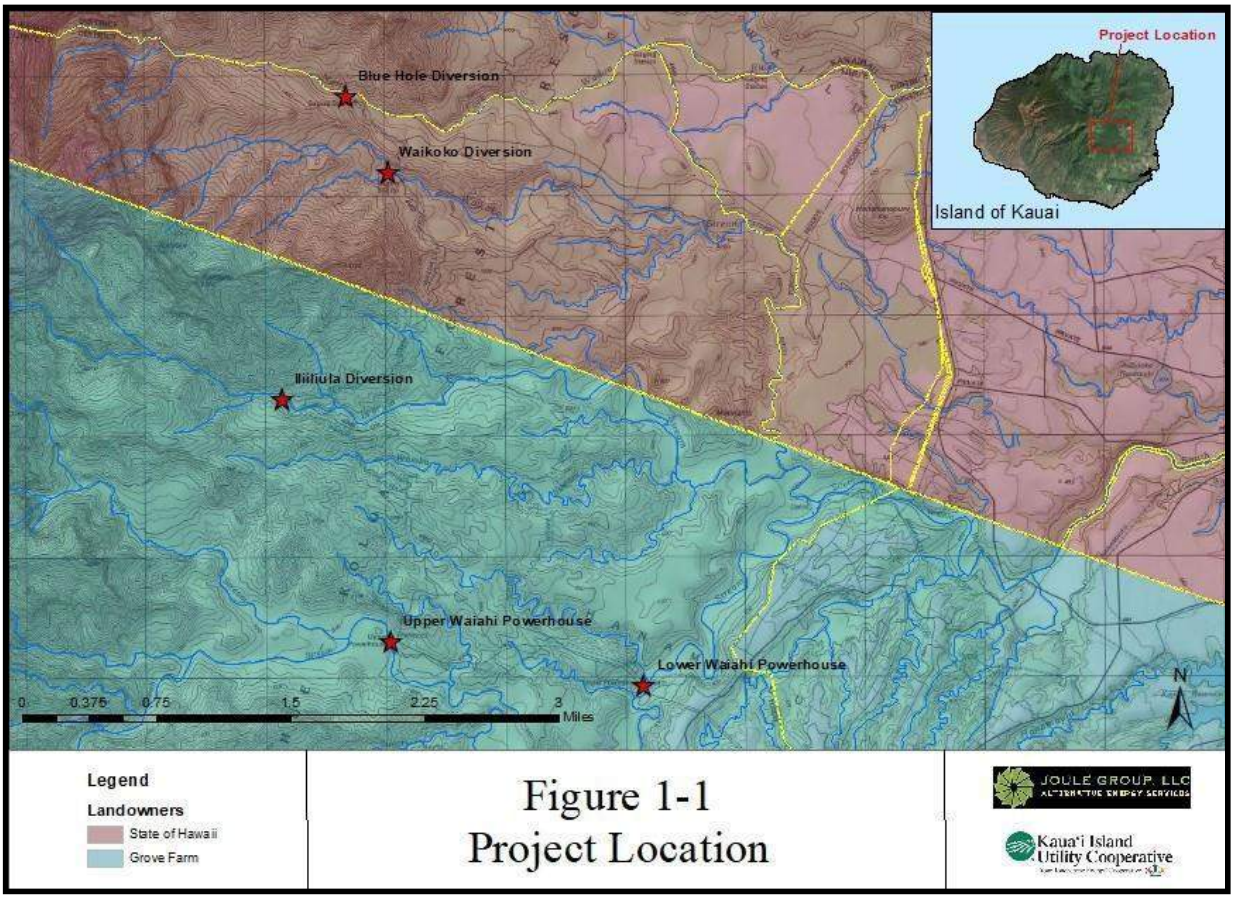
- North Fork Wailua River
- Waikoko Stream
- Ili‘ili‘ula Stream

The North Fork Wailua River and Waikoko Stream diversions are collectively referred to as Blue Hole. The primary diversion to the Lower Waiahi Plant include the following:

- Ili‘ili‘ula Stream
- Waiahi Stream

Project Location and Land Ownership

The Waiahi Hydropower plants are in the Puna Moku on the Island of Kauai, mauka of Wailua, Līhu‘e, and Wailua River State Park, as shown in **Figure 1-1**. The North Fork Wailua River and Waikoko Stream diversions (Blue Hole) are located on tax map key (TMK) (4) 3-9-001:001, which is owned by the


Project Location
Island of Kauai
Blue Hole Diversion
Waikoko Diversion
Iliiliula Diversion
Upper Waiahi Powerhouse
Lower Waiahi Powerhouse
0 0.375 0.75 1.5 2.25 3
Miles
N
Legend
Landowners
State of Hawaii
Grove Farm
Figure 1-1
Project Location
JOULE GROUP, LLC
ALTERNATIVE ENERGY SERVICES
Kaua'i Island
Utility Cooperative

APPENDIX III

SMS RESEARCH

Interviewer: _____	**Waiahi Project**	Date: _____
Interviewee: _____	**nal Interview Outline**	Address and/or telephone number for the meeting:
Address:		

Thank you for agreeing to meet with me today to discuss the Waiahi project, which I will be describing to you shortly. Our goal is to learn about your community needs and to discuss the new project. Your comments are 100% confidential. No one outside of SMS professionals will review your comments. SMS will only report aggregated comments from everyone being interviewed.

1. **Can you first tell me about yourself and your history with the local community? How long have you been with (company) and how long on the island of Kauai?**

_____

_____

2. **What are some of the major issues that the community is facing? Some of your concerns?**

_____

_____

3. **Please review the document describing the Waiahi Project. The request is to convert the current revocable permit water diversion lease to a long-term lease that will enable KIUC to invest in the permanent modifications of the Upper and Lower Waiahi Hydropower Plants Can you tell me your immediate reaction to the project?**

_____

_____

4. **What do you think might be some positive impacts of this project on your business, your customers or your community?**

_____

_____

5. **Do you think it will have any negative impacts? Like what?**

_____

_____

6. **Do you have any suggestions regarding the project or ideas on what else should be done?**

_____

7. **You mentioned_____as a potential concern or negative impact. If that concern cannot be solved, is there anything else that could be done to make up for it, to make it easier on the people affected, or to make it more palatable?**

_____

_____

8. **Anything else you'd like to bring up to add to the report on the proposed project?**

_____

_____

Many thanks!

APPENDIX IV

Environmental Impact of the Upper and Lower Waiahi Hydroelectric Plants

TRUTTA Environmental Solutions assessed the environmental impact of the Upper and Lower Waiahi Hydroelectric Plants on the native stream animals with respect to habitat changes, barriers to migration, and entrainment using the GIS model-based Hawaiian Stream Habitat Evaluation Procedure (HSHEP) in 2017.

The Hawaii Division of Aquatic Resources (DAR) recommended that HSHEP be applied to the Wailua River and its tributaries to quantify of the amount and distribution of native stream animal habitat and the impacts on native stream animals' habitat resulting from the Upper and Lower Waiahi Hydroelectric Plants. Two scenarios were to be compared with the HSHEP model:

1. To assess suitable habitat in the situation with the hydropower plant and other major infrastructure and land use conditions as they currently exist, and
2. To assess suitable habitat with the hydropower plant removed and all other conditions the same.

Eight species of native stream animals were selected for the purposes of quantifying habitat availability in Wailua River. The list includes five species of fish, two species of crustaceans, and one species of mollusk. This group contains the characteristic amphidromous stream animals found in Hawaiian streams.

Results from the HSHEP model suggest that the non-climbing stream fishes (‘O‘opu Naniha and Akupa), Stenogobius hawaiiensis and Eleotris sandwicensis, the native shrimp (‘Ōpae ‘Oeha‘a), Macrobrachium grandimanus, the climbing fish (‘O‘opu Alamo‘o, Nākea, and Nōpili), Lentipes concolor, Awaous guamensis and Sicyopterus stimpsoni and mollusk (Hīhīwai) Neritina granosa had no or little habitat lost due to the hydropower facilities and thus none of these species were expected to be negatively influenced in the future by the hydropower facilities. Most habitat units predicted in the HSHEP model to be lost because of the Upper and Lower Waiahi Hydroelectric power plants systems involved habitat for the native mountain shrimp (‘Ōpae Kala‘ole), Atyoida bisulcata. The hydropower system was predicted to eliminate 9.7% of the total amount of habitat found in the Wailua River system for this species.

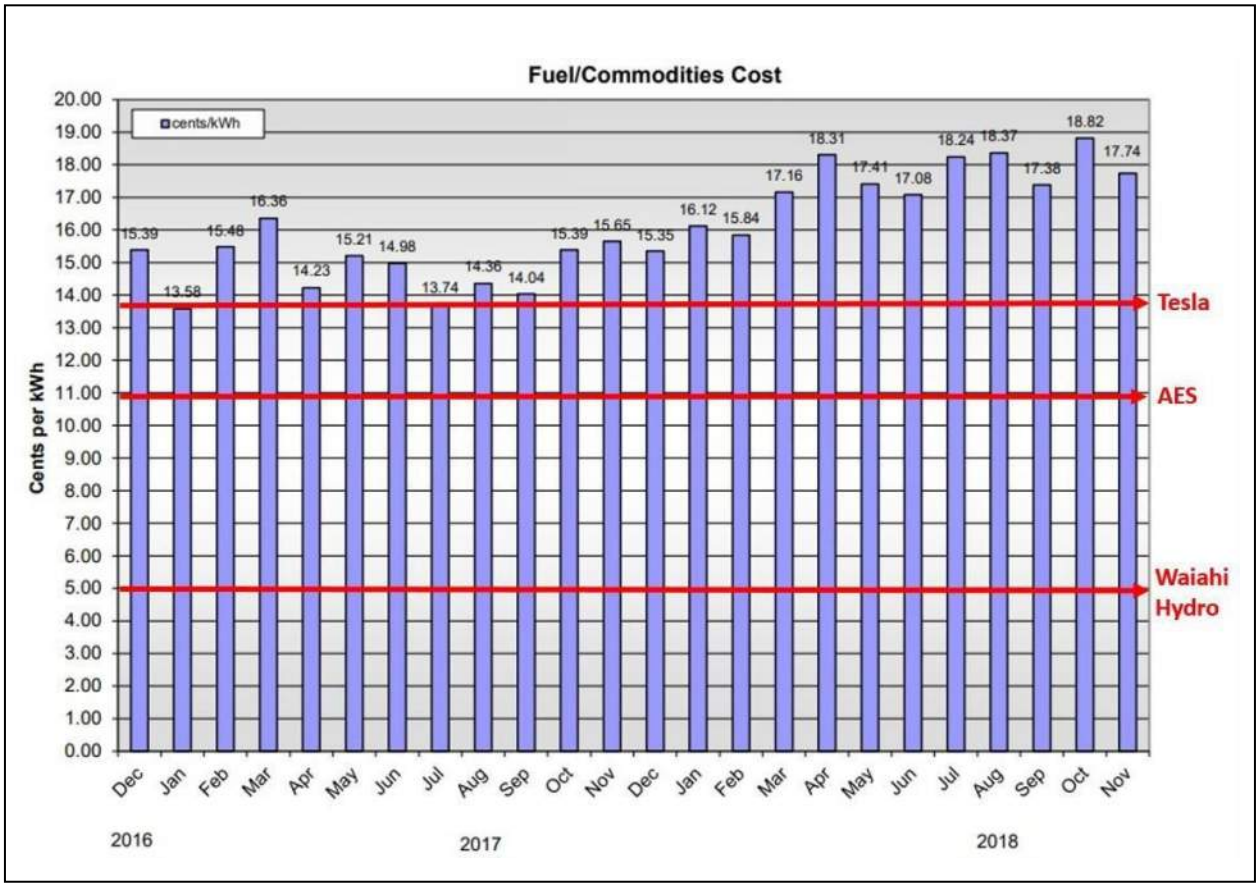
Entrainment of stream animals is predicted by the HSHEP model to be the greatest impact for the Upper and Lower Waiahi Hydroelectric power plants and associated water collection systems and therefore actions to limit entrainment would be beneficial to stream animals. The main diversions on the North Fork, ‘Ili‘ili‘ula, Waikoko, Waiaka, and Waiahi Streams all divert a large percentage of low to moderate flows. As a result, most downstream drifting larvae will be caught in the diversion system. The single most influential barrier in the HSHEP model was Wailua Falls on the South Fork of the Wailua River. It essentially eliminated passage for all native amphidromous species except for Atyoida bisulcata (‘Ōpae Kala‘ole).

While this assessment was not designed to look at ways to improve or optimize the current operation of the Upper and Lower Waiahi Hydropower system, two primary actions could be recommended for improving stream animal populations associated with the hydropower facility.

1. Optimize the location and amount of water diverted and design permanent downstream water releases within the diversion system in order to maximize habitat and aid passage for Atyoida bisulcata (‘Ōpae Kala‘ole) while retaining current diversion quantities.
    a. The use of this HSHEP model for Wailua River would be an excellent resource to aid in optimizing downstream releases by testing various scenarios.
2. Reduce entrainment of Atyoida bisulcata (‘Ōpae Kala‘ole) into the generation facilities to avoid mortality associated with passage through the turbines.

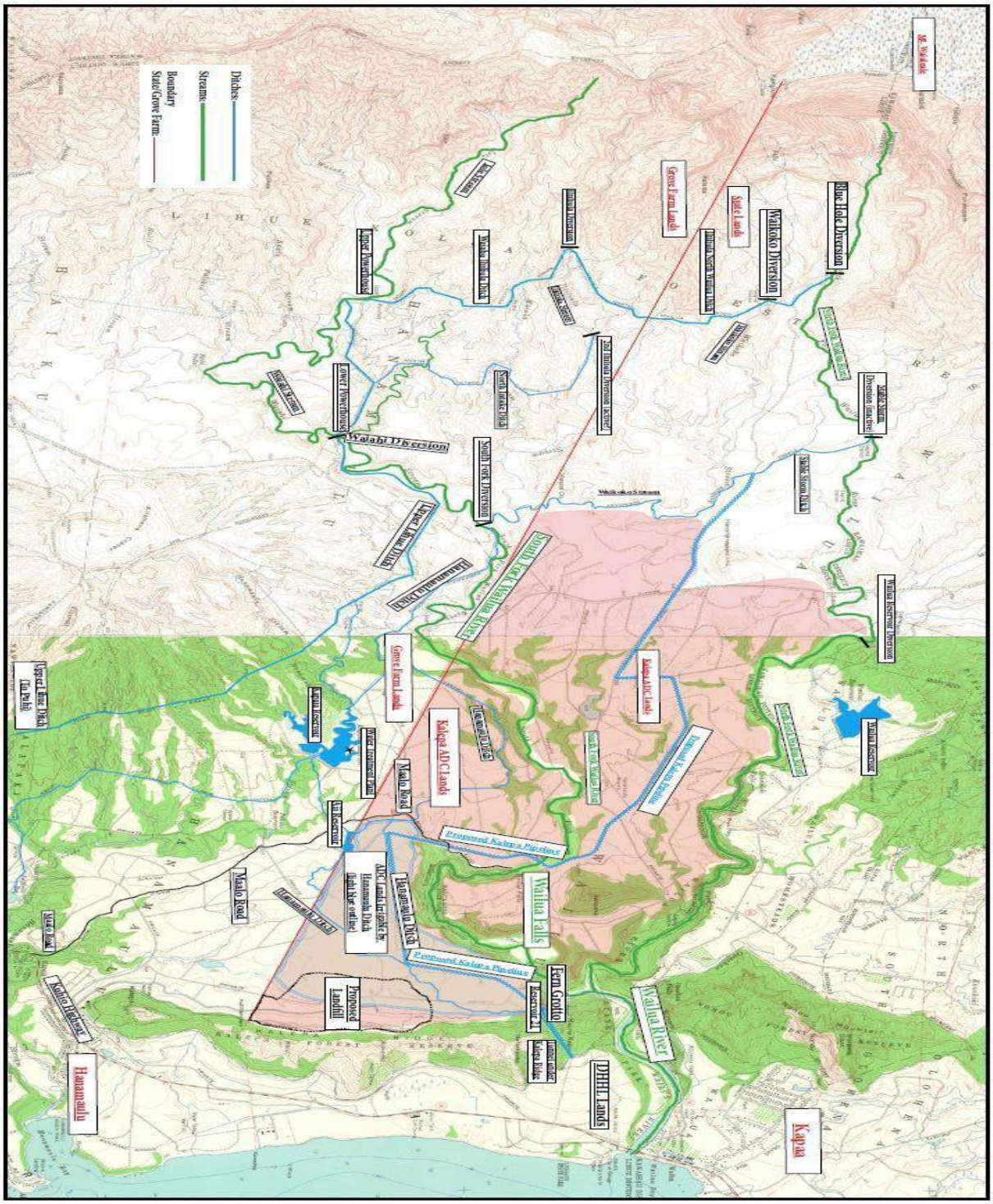
APPENDIX V

Diesel Fuel Costs with Renewables Overlay



APPENDIX VI

EKWUC White Paper


Ditches
Streams
Boundary
State/Grove Farm
Mt. Waialeale
Blue Hole Diversion
Waikoko Diversion
State Lands
Grove Farm Lands
Waiahi Diversion
Waiahi Diversion
Upper Waiahi Ditch
Upper Waiahi Ditch
Upper Waiahi Ditch

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6962
Fax: 808-245-3277

WHITE PAPER

Blue Hole Diversion and East Kauai Ag Lands

December 1, 2004

Summary:
The discussions to date regarding the KIUC application to divert water at Blue Hole and Waikoko Streams for power production fail to encompass the impact on existing irrigation systems on State Kalepa lands down- stream of the power houses. No proposal being put forth ensures the continued operation of this system ser- vicing hundreds of acres of prime ag land, and being necessary for the supply of water to the adjacent DHHL lands.

Explanation:
The East Kauai Water Users Cooperative holds a Revocable Permit from DLNR for the Hanamaulu Ditch on the ADC administered "Kalepa Lands" between Lihue and Kapaa and behind Kalepa Ridge. Hanamaulu Ditch is capable of irrigating about 800 acres of the prime farming area of these lands, of which 300 are presently being farmed. In addition, the Coop supplies water via Hanamaulu Ditch to Reservoir 21 and through a tunnel to the DHHL lands to the east of Kalepa Ridge and adjacent to Kuhio Highway.

The Hanamaulu Ditch originates at a diversion where the Waiahi and Waikoko Streams meet on Grove Farm land to form the South Fork of the Wailua River. The diverted water includes the natural stream flow, water from the Blue Hole and Waikoko diversion on State land, and numerous diversions on Grove Farm land.

The ditch flows on Grove Farm land for about a mile, in the process providing water to Kapaia Reservoir and ag lands along the way, before entering the ADC Kalepa Lands. The Coop has an agreement with and pays Grove Farm $1800 yearly to convey water to Hanamaulu Ditch. The ditch flows for some distance on the ADC land at an elevation lower than most, but not all, of the adjacent fields. Once it crosses Maalo Road it becomes able to irrigate about 800 acres of the ADC lands, plus the DHHL lands.

The study by the Commission on Water Resource Management of the Blue Hole and Waikoko diversions largely overlooks the Hanamaulu Ditch and the likely consequences of a changes in the Blue Hole and Waikoko diversions upon the ADC lands. The impact on the DHHL lands was mentioned, but not in the con- text of how the diversion and conveyance of water to those lands was going to be possible without Grove Farm operating the diversion and first mile of the ditch and the Coop operating the remaining ditch until Reservoir 21.

Action Requested:
The present deliberations regarding the KIUC water license must take into account the continued supply of water to the State ADC Kalepa lands. A failure to do so will not only leave hundreds of acres of prime ag land without irrigation potential, but likely make impossible the conveyance of water to the DHHL lands at the end of the existing system.

December 3, 2018

East Kauai
Water Users' Cooperative
4334 Rice Street, Suite 202
Lihue, Kauai Hawaii 96766
Phone: 808-246-6962
Fax: 808-245-3277

Dec. 11, 2018

TO:

Suzanne Case, Chair
Board of Land and Natural Resources
State of Hawaii

RE:
Coop Water RP Renewal with regard to DHHL Reservations

Aloha Chairperson Case:

As detailed in the staff submittal for item D-13, it is expected that legislation will again be introduced this session for the Department of Agriculture to take over management of the East Kauai irrigation system which includes Wailua Reservoir and Upper Kapahi Reservoir. The Coop is vigorously working to get this legislation passed.

In addition to East Kauai, the Coop services the ADC "Kalepa lands" behind Kalepa ridge utilizing the Hanamaulu Ditch. The CWRM staff reports and meetings regarding KIUC's Blue Hole diversion permit have not to date encompassed the service of water to these ADC lands, but only discussed Hanamaulu Ditch in terms of water reservations for the DHHL lands at the very end of the system (reservations we fully support).

Presently water in the South Fork is diverted on Grove Farm land into the Hanamaulu Ditch. It is first utilized by Grove Farm, then the ADC lands and finally, through Reservoir 21, the DHHL lands—see attached map to understand this complex system.

If KIUC is not granted a permit for their hydro use, the amount of water available in the South Fork will be substantially reduced. The obligation of Grove Farm to divert water for either ADC or DHHL land use might then fall into question—a key issue which has yet to be addressed. If the permit is granted for Blue Hole, then the diversion of water into the Hanamaulu Ditch must be addressed and a continued supply to both the ADC lands and DHHL lands assured in the process.

Sincerely,

Jerry Ornellas
President, East Kauai Water Users Cooperative

Attachments: Water system map; EKWUC white paper

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APPENDIX G
Pre-Assessment Consultation

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Jennifer Scheffel

From: Tatum, Alton L CTR (US) <Alton.L.Tatum@usace.army.mil>
Sent: Tuesday, August 7, 2018 5:11 PM
To: Jennifer Scheffel
Cc: Williams, Albert P POH
Subject: POH-2018-00175 (Waiahi Hydropower Water Lease, Puna District, Island of Kauai, HI)

Aloha Ms. Scheffel,

Your project has been assigned Department of the Army File No. POH-2018-00175 and is currently assigned to Mr. Albert Williams (PROJECT MANAGER). You may contact him at (808) 835-4303 or via email at Albert.P.Williams@usace.army.mil.

If you have not received a response from the above project manager within 30 days, please contact our main office at (808) 835-4303 or via email at CEPOH-RO@usace.army.mil.

Mahalo,

ALTON L. TATUM
Administrative Assistant, Regulatory Office USACE-Honolulu District Bldg 252 Fort Shafter, HI 96858-5440
Phone: (808)-835-4303
Fax: (808)-835-4126

http://www.poh.usace.army.mil/Missions/Regulatory/

March 26, 2019

SSFM 2018_085

Mr. Alton L. Tatum, Administrative Assistant
U.S. Army Corps of Engineers
Honolulu District
Regulatory Office, CEPOH-EC-R
Fort Shafter, HI 96858-5440

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Mr. Tatum,

Thank you for your email dated August 7, 2018 assigning the subject project (Army File No. POH-2018-00175) to Project Manager Albert Williams. A comment letter was received from Mr. Williams on August 17, 2018. A response letter will be sent directly to Mr. Williams.

Your letter, along with this response letter, will be included in the forthcoming Draft Environmental Assessment. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

Jennifer Scheffel

From: Williams, Albert P CIV USARMY CEPOH (US) <Albert.P.Williams@usace.army.mil>
Sent: Friday, August 17, 2018 9:27 AM
To: Jennifer Scheffel
Subject: POH-2018-00175-APW, Waiahi Hydropower Water Lease

Aloha Ms. Scheffel,

We have received your letter dated July 23, 2018 requesting comments for the Waiahi Hydropower Long-Term Water Lease, DA File No. POH-2018-00175-APW. Please reference this number in all future correspondence concerning this project.

We have completed review of your submittal pursuant to Section 404 of the Clean Water Act (Section 404) and Section 10 of the Rivers and Harbors Act of 1899 (Section 10). Section 404 requires authorization prior to the discharge and/or placement of dredged or fill material into waters of the U.S., including adjacent wetlands. Section 10 requires authorization prior to conducting work in, over, under, and affecting navigable waters.

Based on the submittal, we are not able to determine if a permit would be required for this project. Please have the applicant submit plans for the proposed modifications and repairs to the diversion structure as well as any other in stream work associated this project. Once the additional information is received, we can determine if a permit would be required for the project.

If you have any questions or concerns related to this, please contact me at your convineance.

Respectfully,
Albert Williams
Regulatory Specialist, Regulatory Branch U.S. Army Corps of Engineers Honolulu District
808-835-4056

March 26, 2019

SSFM 2018_085

Mr. Albert Williams, Regulatory Specialist
U.S. Army Corps of Engineers
Honolulu District
Regulatory Office, CEPOH-EC-R
Fort Shafter, HI 96858-5440

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Mr. Williams,

Thank you for your email dated August 17, 2018 regarding the subject project (Army File No. POH-2018-00175). We offer the following response to your comment.

Project plans for the proposed modifications and repairs to the diversion structures and a description of any in-stream work will be included in the Draft Environmental Assessment (EA). A copy of the Draft EA will be provided for your review.

Your letter, along with this response letter, will be included in the forthcoming Draft EA. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 27, 2018

SSFM International, Inc.
Attn: Ms. Jennifer M. Scheffel, Sr. Environmental Planner via email: jscheffel@ssfm.com
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for **Waiahi Hydropower Long-Term Water Lease**

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the Division of Forestry & Wildlife on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

19054

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2018 AUG 27 AM 8:23
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

July 24, 2018

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Kauai District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for **Waiahi Hydropower Long-Term Water Lease**
LOCATION: Puna District, Island of Kauai; TMK: (4) 3-9-001:001
APPLICANT: Kauai Island Utility Cooperative

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **August 22, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: _____
DAVID G. SMITH, Administrator
Print Name: _____
Date: _____

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

August 20, 2018

MEMORANDUM

TO: Russell Y. Tsuji, DLNR Land Administrator

FROM: David G. Smith, DOFAW Administrator DGS

CC: Katie Ersbak, DOFAW Watershed Planner
Sheri Mann, DOFAW Kauai Branch Manager
Ian Hirokawa, DLNR Land Division

SUBJECT: DOFAW Comments on KIUC Waiahi Hydropower Long-Term Water Lease, Pre-Assessment Consultation for Draft Environmental Assessment

The Department of Land and Natural Resources (Department), Division of Forestry and Wildlife (DOFAW) would like to provide the following comments on Kaua'i Island Utility Cooperative's (KIUC) proposed action to obtain a long-term water lease from the Board of Land and Natural Resources (BLNR) for the diversion of water from Blue Hole and Waikoko for hydropower on the island of Kaua'i.

Watershed Management Plan

As part of the statutory requirements for obtaining a water lease (§178-58 HRS), the lessee and the Department must jointly develop and implement a watershed management plan (§178-58(e)). DOFAW has met with KIUC to discuss this requirement and is in the process of determining alternative actions, possibly a fee to implement watershed protection actions, in lieu of developing a new watershed management plan. DOFAW and the Department will meet will all applicants prior to BLNR consideration of a water lease to explain how this section of the statute will be implemented.

Access to the Lihue-Koloa Forest Reserve

The Blue Hole and Waikoko diversion structures are located on State DOFAW managed land in the Līhu'e-Kōloa Forest Reserve (TMK: (4) 3-9-001:001). DOFAW's Kaua'i Branch (KDOFAW) has expressed concerns about KIUC accessing the diversions without proper authorization. KDOFAW is in the process of meeting with KIUC to resolve this issue and create the necessary access agreements. Future modifications to the Blue Hole and Waikoko diversions structures to meet the Interim Instream Flow Standards (IIFS), maintenance of these structures, and entry into Līhu'e-Kōloa Forest Reserve will be subject to the access agreements.

Environmental Assessment

It is our understanding that KIUC and its contractors are in the process of conducting studies to support an Environmental Assessment (EA). A separate access agreement with KDOFAW and KIUC contractors may be needed for EA related activities at the Blue Hole and Waikoko diversions. If studies have already taken place, please inform KDOFAW of prior activities, specifically as it relates to the Newcomb's snail (*Erinna newcombi*). Ensure that the Draft EA will be circulated to appropriate staff as KDOFAW for further review and comment.

SSFM International

June 7, 2019

SSFM 2018_085

Mr. Russell Y. Tsuji, Land Administrator
Department of Land and Natural Resources
Land Division
PO Box 621
Honolulu, HI 96809

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Mr. Tsuji,

Thank you for your letter dated August 27, 2018 regarding the subject project. We appreciate your distributing our pre-assessment consultation letter throughout the divisions of the Department of Land and Natural Resources. We offer the following response to the comments received from the Division of Forestry and Wildlife (DOFAW).

The Kauai Island Utility Cooperative (KIUC) has been in communication with DOFAW on several occasions regarding ways to satisfy the watershed management plan requirements as they pertain to the water lease (§178-58(e)). It is KIUC's understanding that DOFAW and Land Division have jointly developed a Watershed Management and Protection Cost Share Formula and Contribution for Leases of Water Rights and submitted the plan to the Board of Land and Natural Resources (BLNR) at the March 22, 2019 meeting. KIUC looks forward to working with DOFAW on watershed management in the Wailua watershed.

KIUC has been accessing the site through the Revocable Permit (RP) and verbal agreement with Kauai DOFAW Branch Manager and staff during previous administrations since its initial RP in 2004. KIUC learned from the new Branch Manager at Kauai DOFAW in 2018 that there were concerns from DOFAW that the RP did not fully cover DOFAW's terms for access during road closure periods or other abnormal circumstances. Since that time, KIUC has been working with DOFAW to address these concerns and will continue to coordinate with DOFAW regarding access to the North Fork Wailua River and Waikoko Stream diversion structures during construction and for future maintenance activities. It is KIUC's understanding that the lease will address access to the site.

KIUC has met with DOFAW multiple times in 2018 to provide updates on study activities and the EA. As mentioned in those meetings, stream studies were conducted in February and June 2018,

June 7, 2019

Flora and Fauna studies were conducted in September 2018, and archaeological and historic site surveys were conducted in October 2018 to support the preparation of an Environmental Assessment (EA). No samples were taken during any of the surveys. KIUC is in the process of completing a Draft EA for the proposed project. All survey reports will be included as appendices to the Draft EA, which will be provided to DOFAW for review.

Your letter, along with this response letter, will be included in the forthcoming Draft EA. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 28, 2018

SSFM International, Inc.
Attn: Ms. Jennifer M. Scheffel, Sr. Environmental Planner via email: jscheffel@ssfm.com
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Dear Ms. Scheffel:

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for **Waiahi Hydropower Long-Term Water Lease**

Thank you for the opportunity to review and comment on the subject matter. In addition our previous comments dated August 27, 2018, enclosed are comments from the Engineering Division on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

JUL 25 AM 10:50 ENGINEERING

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 24, 2018

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Kauai District
X Historic Preservation

FROM

To

RECEIVED
LAND DIVISION
2018 AUG 22 AM 10:37
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for **Waiahi Hydropower Long-Term Water Lease**
LOCATION: Puna District, Island of Kauai; TMK: (4) 3-9-001:001
APPLICANT: Kauai Island Utility Cooperative

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **August 22, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: Carty S. Chang, Chief Engineer
Date: 8/20/18

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Assessment Consultation for Draft Environmental Assessment for Waiahi Hydropower Long-Term Water Lease, Puna District, Island of Kauai; TMK: (4) 3-9-001:001

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 6/20/19

SSFM International

March 26, 2019

SSFM 2018_085

Mr. Russell Y. Tsuji, Land Administrator
Department of Land and Natural Resources
Land Division
PO Box 621
Honolulu, HI 96809

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Mr. Tsuji,

Thank you for your letter dated August 28, 2018 regarding the subject project. We appreciate your distributing our pre-assessment consultation letter throughout the divisions of the Department of Land and Natural Resources. We offer the following response to the comments received from the Engineering Division.

The proposed project activities are all located in areas designated as Flood Hazard Zone X and would not involve the construction of any new buildings or facilities.

Your letter, along with this response letter, will be included in the forthcoming Draft EA. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD 18-1445O

August 28, 2018

SSFM International Inc.
RECEIVED
9.12.2018

Jennifer M. Scheffel
Senior Environmental Planner
SSFM International
99 Aupuni Street, Suite 202
Hilo, HI 96720

Re: Pre-Assessment Consultation for a Draft Environmental Assessment for Waiahi Hydropower Long-Term Water Lease
Wailua Ahupua'a, Puna Moku, Kaua'i Mokupuni
Tax Map Key: (4) 3-9-001:001

Aloha e Ms. Scheffel:

The Office of Hawaiian Affairs (OHA) has received your letter requesting comments in preparation for a Draft Environmental Assessment (Draft EA) for a 65-year water lease to the Kaua'i Island Utility Cooperative (KIUC). The water lease will enable KIUC, the lessee, to continue to divert water from the North Fork of the Wailua River (referred to as "Blue Hole") and Waikoko Stream to continue operation of the Upper and Lower Waiahi Hydropower Plants.

KIUC operates the Upper and Lower Waiahi Hydropower Plants pursuant to Revocable Permit (RP) No. S-7340. In December 2017, the Board of Land and Natural Resources (BLNR) approved the holdover of the RP on the condition that KIUC complete various items, including a Draft EA. As stated in your letter, in 2004, KIUC requested a long-term lease from the BLNR to divert water from Blue Hole and Waikoko Stream. As you may know, OHA objected to the KIUC's request for the long-term lease in 2004 because, in part, KIUC and the BLNR did not consider the diversion's impacts on Native Hawaiian cultural practices and stream life. OHA also objected to a lack of an environmental assessment. To resolve these issues, OHA requested a contested case hearing. In 2006, OHA entered into a memorandum of agreement (MOA) with KIUC to address these concerns. In the MOA, OHA and KIUC addressed various issues, including an agreement to the scope of a cultural impact assessment and the scope of a stream life study. In 2012, OHA withdrew its request for a contested case hearing.

In accordance with the MOA, KIUC conducted a draft study of the impacts to stream life and submitted its report to OHA in 2013. In a letter dated November 8, 2013, OHA submitted comments on the draft stream study report. In 2017, KIUC conducted a cultural impact

assessment (CIA) and submitted its report to OHA. In a letter dated November 17, 2017, OHA provided comments on the draft CIA report. In the letter, OHA expressed concerns that the CIA scope of work was far narrower than the scope of work agreed to pursuant to the MOA (MOA scope of work). A total of seven tasks were agreed to under the MOA scope of work, including determining the extent of the lease's impacts to cultural resources and Native Hawaiian practices; proposing viable mitigation actions to reduce impacts to Native Hawaiian cultural practices; conducting field studies of all project areas including Upper and Lower Waiahi Hydropower Plants, 'Ili'ili'ula Stream, and other water sources relevant to the study; and completing a thorough study and research of historical documents, Land Commission Awards, and historic maps. In the November 17, 2017 letter, OHA expressed concerns that the scope of these tasks were incomplete and feel far short of the MOA scope of work agreed to by OHA and KIUC. OHA also recommended that additional consultation be conducted to discuss stream flow restoration and to gather information about cultural resources and practices in the lease area. OHA expects that the revised CIA addresses OHA comments in the November 17, 2017 letter.

Pursuant to Hawai'i Administrative Rules (HAR) § 11-200-10(6), a Draft EA shall contain "identification and summary of impacts and alternatives considered." Impacts include primary, secondary or cumulative beneficial and detrimental effects.[1] Notably, the express language of the rules' required alternatives analysis contemplate an analysis of more than one alternative, "in addition to the proposed action in the environmental assessment";[2] later rule provisions also suggest that "particular attention . . . be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, and risks."[3] To adequately identify impacts and alternatives the 65-year water lease will have on the environment, which includes Native Hawaiian cultural practices and stream life, OHA suggests that the CIA report and the stream report be revised to address OHA's comments and that the results of these reports be considered when identifying environmental impacts and alternatives. OHA recommends that OHA's comments be included with the CIA report in the Draft EA. Further, OHA recommends that the project alternatives section of the Draft EA include various alternatives, including the alternative of diverting less water than the preferred alternative.

As stated in your letter, the Upper and Lower Waiahi Hydropower Plants have been in operation for more than 80 years and use water diverted from streams within the Wailua watershed. OHA recommends that the Draft EA address both current and historic impacts of the water diversion, including impacts to Native Hawaiians' abilities to traverse or utilize the license area to engage in traditional and customary practices. This information would likely be gathered during the CIA consultation. As you may also be aware, the Commission on Water Resources Management is currently working on updating the interim instream flow standards (interim IFS) for the surface water hydrologic unit of Wailua, which includes the lease area. OHA recommends that the Draft EA's consideration of alternatives and impacts address the likelihood that the interim IFS may change.

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[1] *See* HAR § 11-200-2.
[2] *See* HAR § 11-200-9(c).
[3] *See* HAR § 11-200-16(f) (with regards to alternatives discussed in an environmental impact statement).

Mahalo for the opportunity to comment. We look forward to reviewing the Draft EA. Should you have any questions, please contact Teresa Kaneakua, OHA Lead Compliance Specialist, at (808) 594-0231 or teresak@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:tk

C: Dan Ahuna, OHA Kaua'i and Ni'ihau Trustee (*via email*)
Kaliko Santos, OHA Kaua'i Community Outreach Coordinator (*via email*)

SSFM International

June 7, 2019

SSFM 2018_085

Mr. Kamana‘opono M. Crabbe, Ph.D.
Chief Executive Officer
Office of Hawaiian Affairs
560 N. Nimitz Highway, Suite 200
Honolulu, HI 96817

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Dr. Crabbe,

Thank you for your letter dated August 28, 2018 regarding the subject project. We offer the following responses to your comments.

Kauai Island Utility Cooperative's (KIUC) understanding of the Revocable Permit (RP) holdover conditions is as follows per the Board of Land and Natural Resources (Board) December 8, 2017 meeting minutes as approved on January 12, 2018.

Within one year, KIUC will provide the Board with a proposal for the partial restoration of flow to the Wailua River, which could be satisfied by the adoption of interim instream flow standards.

- Direct DLNR staff to work with landowners on what is expected for the watershed management plan.
- KIUC shall consult with the Department of Hawaiian Home Lands (DHHL) and honor DHHL's reservation rights of water under the law.
- We have met all the conditions and reported back to the Board as will be outlined in the Draft Environmental Assessment (EA).

Thank you for your comments on the Draft Cultural Impact Assessment (CIA). As you may know, KIUC has completed additional work in support of an expanded CIA since the 2017 draft. The expanded CIA will be included as an appendix to the Draft EA.

Thank you for the additional comments and recommendations. We will take all of these points into consideration as we are preparing the Draft EA.

June 7, 2019

Your letter, along with this response letter, will be included in the forthcoming Draft EA. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS201808210819NA

August 22, 2018

SSFM International, Inc.
RECEIVED
8-31-2018

Ms. Jennifer M. Scheffel
Senior Environmental Planner
SSFM International, Inc.
99 Aupuni Street, Suite 202
Hilo, Hawaii 96720

Dear Ms. Scheffel:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment – Waiahi Hydropower Long-Term Water Lease, Puna District, Kauai; TMK: (4) 3-9-001: 001

Thank you for the opportunity to provide early consultation comments for the Draft Environmental Assessment (Draft EA) being prepared for the Waiahi Hydropower Long-Term Water Lease project. The request for early consultation review was transmitted to our office via letter dated July 23, 2018.

It is our understanding that the applicant, Kauai Island Utility Company, has applied for a 65-year water lease from the Department of Land and Natural Resources to divert water from Blue Hole and Waikoko Stream to continue its electricity production, transmission, and distribution from the Upper and Lower Waiahi Hydropower Plants. The proposed action includes two phases: the long-term water lease and the permanent modification to the diversion structures at Blue Hole and Waikoko Stream.

The Office of Planning (OP) has reviewed the transmitted material and has the following general comments to offer:

1. Hawaii State Planning Act. Pursuant to Hawaii Administrative Rules (HAR) § 11-200-10(4) – general description of the action's technical, economic, social, and environmental characteristics; this project must demonstrate that it is consistent with State environmental, social, economic goals, and policies. Hawaii Revised Statutes (HRS) Chapter 226, the Hawaii State Planning Act, provides goals, objectives, policies, planning coordination and implementation, and priority guidelines for growth, development, and the allocation of resources throughout the State.

   The Draft EA should include a discussion on the project's ability to meet all parts of HRS Chapter 226. The analysis should examine the project's consistency with these statutes, clarify where it conflicts with them, and identify what steps will be taken for the project

to be in consistent with HRS Chapter 226. If any of these statutes are not applicable to the project, the analysis should affirmatively state such determination, followed by discussion paragraphs.

a. Energy Use and Development. HRS § 226-103(f) – Economic Priority Guidelines, Energy Use and Development. The Draft EA should include analysis on the project's consistency with the development, demonstration, and commercialization of renewable energy sources.

b. Sustainability. HRS § 226-108 – the priority guidelines and principles to promote sustainability. The Draft EA should include an examination of the project's consistency with the principles of sustainability.

2. Hawaii Coastal Zone Management Program. The Coastal Zone Management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1).

   The Draft EA should include an assessment as to how the proposed action conforms to each of the goals and objectives listed in HRS § 205A-2. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343.

3. Stream Water Quality and Impact on the Nearshore Ecosystem. OP will reserve comment on the proposed action and its impact to nearshore water quality, the marine ecosystem, and any mitigation proposed to offset these impacts until we are able to review the forthcoming Draft EA.

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Director

March 26, 2019

SSFM 2018_085

Mr. Leo R. Asuncion, Director
State of Hawaii Office of Planning
PO Box 2359
Honolulu, HI 96804

SUBJECT: Waiahi Hydropower Long-Term Water Lease
Puna District, Island of Kauai
Tax Map Key (TMK): (4) 3-9-001:001
Response to Pre-Assessment Consultation Comments

Dear Mr. Asuncion,

Thank you for your letter dated August 22, 2018 regarding the subject project. We offer the following responses to your comments.

1. The Draft Environmental Assessment (EA) will include a full discussion on the proposed project's ability to meet all parts of Hawaii Revised Statutes (HRS) Chapter 226 or explain why a section is not applicable to the project.
2. The Draft EA will include an assessment as to how the proposed project conforms to the goals and objectives of the Hawaii Coastal Zone Management Program, HRS Chapter 205A.
3. We will provide a copy of the Draft EA to the Office of Planning for your review.

Your letter, along with this response letter, will be included in the forthcoming Draft EA. We appreciate your participation in the pre-assessment consultation review process. Should you have additional comments or questions regarding this project, please contact me at (808) 356-1273 or via email at jscheffel@ssfm.com

Mahalo,

SSFM INTERNATIONAL, INC.

Jennifer M. Scheffel
Sr. Environmental Planner